

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 27

NEW YORK, NOVEMBER, 1929

No. 11

Metal Working in An Airplane Factory

A Description of the Fabricating Departments of the Boeing Airplane Company

By R. E. JOHNSON

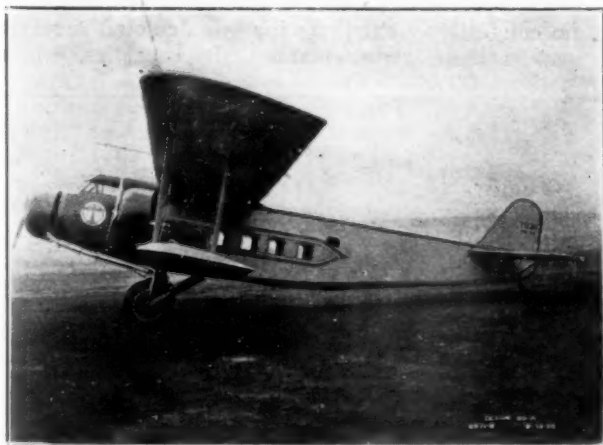
The Boeing Companies, Seattle, Washington

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

OUTSTANDING in the field of aircraft manufacture in the United States is the Boeing Airplane Company of Seattle, which is ranked as the largest factory in the nation devoted exclusively to the manufacture of airplanes. Organized twelve years ago, it has grown

The size and importance of this unit reflects the present importance of metal as a material entering into the construction of today's aircraft.

Aluminum alloys—alclad and dural, aluminum, and steel alloys—chrome molybdenum and nickel, are the most im-



The Finished Product—A Boeing eighteen-passenger tri-motored transport for transcontinental service between Chicago and San Francisco Bay, on a twenty-hour schedule maintained by Boeing System. This plane weighs eight and one-half tons when fully loaded, flies at a speed of 135 miles per hour, and has a ceiling of 15,500 feet.

Its upper wing span is eighty feet.

from a small experimental shop to a plant occupying 350,000 square feet of floor space with 1475 employees. It produces army and navy planes, mail planes, mail-passenger planes, twelve and eighteen passenger transports and other types of aircraft.

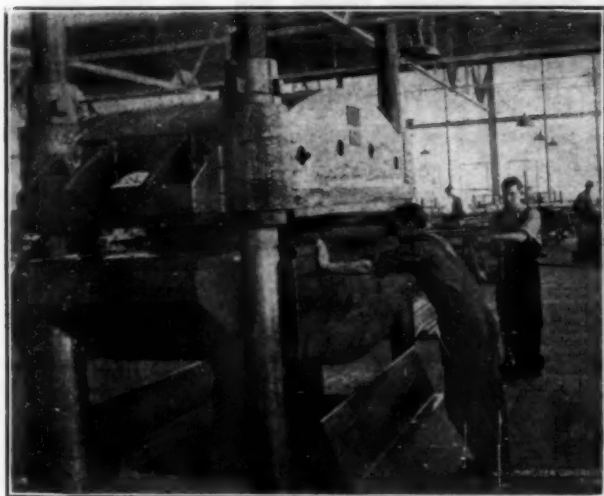
One of the largest and most important divisions of the Boeing production organization is the metal-working unit of the plant, in which a great proportion of the actual construction work is conducted. This unit includes the machine shop, the sheet metal department, welding and brazing section, steel heat treatment room, the aluminum alloy heat treatment section and the metal wing department.

portant of the metals used in the fabrication of Boeing planes. Because of the necessary requirement of strength combined with lightness—maximum strength with a minimum of weight, duralumin is probably the leading material entering into Boeing airplane manufacture.

Sheet metal surfaces, mainly fabricated of dural, are formed in the sheet metal department, which is equipped with modern metal-working machinery, including cutters, rollers, presses, shears and stamps. The dominating piece of equipment is a large 700-ton hydraulic press, in which are formed the majority of surfaces. This press, which has a platen 129" by 60" in size, is powered by city water

pressure, augmented by pressure supplied by an auxiliary electric pump. Dies are formed of hard maple reenforced with brass strips (surfaces are corrugated to increase their strength). Sheet stock, cut to the desired size, is placed in the dies and shaped by the application of power to the press.

Tail assembly surfaces, ailerons, seats and flooring,



700-ton Hydraulic Metal-Forming Press

cowling, fuel tanks, component parts for wings and other parts are produced in the sheet metal department.

Adjoining is the metal wing section, in which wings for the Boeing tri-motored transport planes are constructed. These wings are made of dural, mainly in the form of tubing, secured with dural bolts.

Fuselages for the army and navy single-seater pursuit planes, as well as the single-place sport planes, are constructed of dural tubing, also assembled by bolting. Tubing is drawn in the Boeing developed forty-two foot draw bench, by means of which square, rectangular and stream-lined tubing is drawn from round stock. Steel alloy tubing is also drawn in this bench.

Steel alloy tubing is used in the assemblage of mail-passenger and transport plane fuselages. The tubing is drawn to the desired shapes and sizes and transferred to the welding and brazing department, where the fuselages are assembled by electric arc welding.

When aluminum alloy parts are completed, they are transferred to the aluminum alloy heat treatment section, where they are treated with heat for strengthening.

This section is equipped with heat solution tanks containing a solution of potassium and sodium nitrates, heated to a temperature of 950 degrees Fahrenheit by means of gas and air pipes circulating through the base of the tanks. The duration of the treatment varies from eight to twenty-eight minutes, depending upon the gage of the metal. Dural becomes as strong as average steel after the treatment, testing up to 56,000 pounds per square inch.

Steel parts are strengthened by heat treatment in electric heat furnaces. Chrome molybdenum steel is subjected to a maximum temperature of 1625 degrees F., and nickel steel is treated to a top heat of 1500 degrees F.

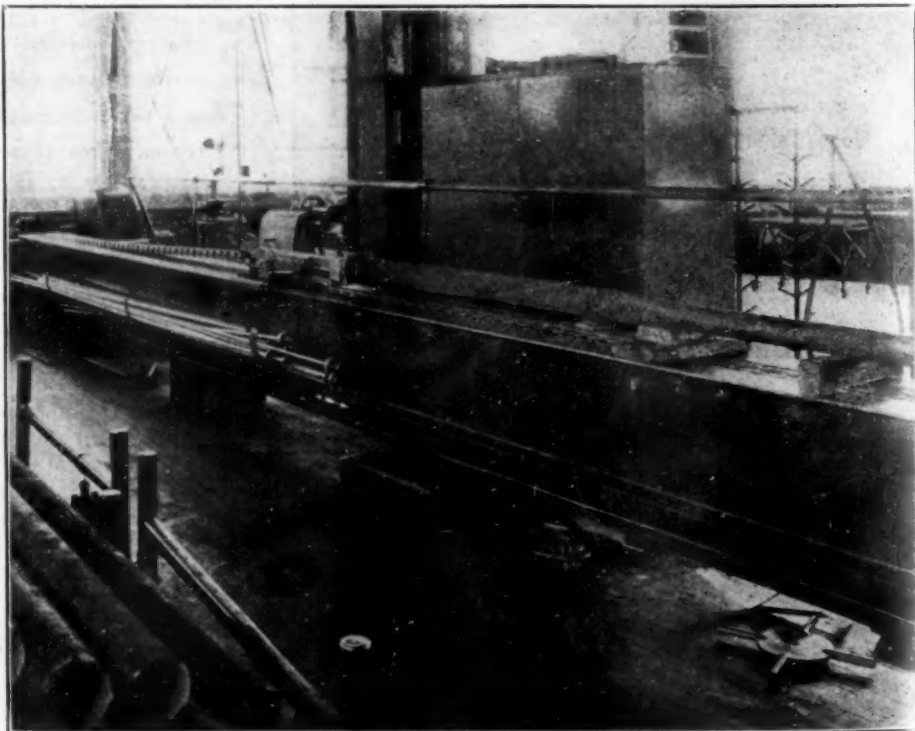
Exposed ferrous parts are plated with cadmium in the plating department to insure them against corrosion. Cadmium plating is particularly successful in preventing rust.

Air transport is of interest and importance to all business men. It is no longer an emergency, once-in-a-while method of transportation and communication. Commercial airplanes in this country are flying more than 70,000 miles daily on scheduled transport operations. Air mail planes fly 40,000 miles a day, carrying ten tons of letters of 108 cities in thirty-seven states. During the first six months of this year 40,000 persons had flown as pay passengers. In 1926 only 5,700 people paid to ride in airplanes. One company, the Boeing System, has flown 7,000,000 miles in twenty-seven months and airplane schedules are as rigid as those of trains.

While the public is best familiar with the airplane as a mail, express and passenger carrier, it is used in a wide variety of pursuits such as aerial photography, dusting of crops, forest patrol work, scientific and geographical studies, aerial advertising, spotting schools of fish, observing traffic congestion, searching for lost persons, surveying and map making, representation of properties, engineering

Drawing Stream-Lined Tubing.

The Boeing engineering personnel has developed a forty-two foot draw bench, by means of which square, rectangular and stream-lined tubing is drawn from round aluminum or steel alloy stock.



surveys, carrying supplies to inaccessible regions, first aid to devastated cities, and for an ever-increasing diversity of commercial purposes.

The longest air mail, express and passenger route in the world is the San Francisco-Chicago route and the second longest is the Los Angeles-Seattle route, both of which are flown by Boeing System.

The Boeing System is inaugurating the first all-plane

power. With its full load the plane can speed 138 miles an hour. These planes have many refinements of an observation car, including hot and cold running water, individual lamps over each upholstered reclining chair, forced ventilation and heating.

Planes are equipped with radiophone which enables pilots to talk from an altitude of 12,000 feet to ground stations 200 miles distant. They also have directive radio



The Plating Department of the Boeing Airplane Company at Seattle. Steel parts are plated with cadmium to prevent corrosion. Cadmium plated parts were tested in a salt spray bath for more than one thousand hours without breaking down.

tri-motored passenger services between the Pacific Ocean and the Great Lakes—twenty-hour flight of giant planes over the 2000 mile span of plain, desert and mountain. These Boeing San Francisco-Chicago transports, which carry eighteen passengers, two pilots and a steward, are said to be the largest planes operated in regular scheduled operations in long distance flights. They exemplify the progress which has been made in commercial aviation.

The Boeing San Francisco-Chicago planes have a wing span of eighty feet, are fifty-five feet long, sixteen feet high, weigh eight and three-quarter tons when fully loaded. The three "Hornet" engines produce 1575 horse-

power. With its full load the plane can speed 138 miles an hour. These planes have many refinements of an observation car, including hot and cold running water, individual lamps over each upholstered reclining chair, forced ventilation and heating. Planes are equipped with radiophone which enables pilots to talk from an altitude of 12,000 feet to ground stations 200 miles distant. They also have directive radio

beacon, a dot-dash system of communication. They fly over a lighted airway. There is a lighted emergency landing field every thirty miles, a revolving beacon every twenty miles, and a flashing beacon every three miles, thus giving a virtual lighted boulevard for flying across the country.

On its transcontinental flights, the Boeing System follows the historic east and west line of travel, the route of the Emigrant Trail and the Pony Express of the days of '49. When the hoofbeats of the Pony Express were silenced by the Iron Horse, this same route became the line of the first transcontinental railroad.

Alloys to Resemble Gold and Silver

Q.—I am attempting to cast small designs in metal and would appreciate your advice on the following:

What composition of metals could be used to produce an alloy to look like gold and which would not tarnish? It should have a fair degree of hardness. Also, what is the formula for a bright silver or nickel finished alloy that will not tarnish?

Could a plaster of paris mold be used, or what do you advise where a fine design is required and is to be repeated a number of times?

A.—A composition that would look like gold and would not tarnish, having a fair degree of hardness, would be composed of 92 copper, 8 aluminum. This material can be cast in die molds made of iron and also in plaster molds that have been baked in the oven until all moisture

has been removed. The plaster molds should be composed of approximately 20 per cent lime, 80 per cent plaster. Each mold can be used for only one cast. It must then be ground up and used with 20 per cent new mixture of plaster and lime. Considerable experience is required to handle plaster molds. However, in the iron die mold you can pour as many castings as you desire.

For bright silver or nickel, we would suggest American silver, composed of 49.36 copper, 20.7 zinc, 24.2 nickel, 1.3 iron, 0.45 tin, 3.83 manganese, 0.13 aluminum. This mixture cannot be cast in die molds but can be cast in plaster or sand molds.

Plaster molding requires quite some insulation; we suggest sand molds for this material.

—W. J. REARDON.

Problems in Handling Metals

Welding Monel Metal Castings

Q.—We have had no success in welding Monel metal castings. We have tried different fluxes and welding rod material. Castings crack and become distorted. Give us all the information to handle this proposition and methods employed.

A.—Success in welding Monel metal requires a knowledge of the properties of this alloy and of its peculiarities under the welding flame. Monel metal is an alloy of nickel and copper containing about 67 per cent nickel, 28 per cent copper, and 5 per cent of other elements such as iron, manganese, silicon and carbon.

In welding Monel metal a few simple precautions must be observed. First, a neutral flame should be used. The tip should be one or two sizes larger than would be required for steel of the same weight and thickness. Cold drawn Monel metal wire rod should be used as welding rod. As a general rule, flux is not required. The oxide film that forms on the surface of the puddle helps to protect the metal underneath from further oxidation.

Keeping the outer envelope of the flame spread over the welded area will also aid in excluding air. The rod should be melted under this skin of oxide and slag. Any particles of dirt or foreign matter should be worked up into the slag by melting underneath them. Then, when the weld is built up well above the surface, as all Monel metal welds should be, grinding will remove all oxide slag and impurities, leaving only good sound metal in the weld.

Monel metal castings present a peculiar combination of properties. Like grey cast iron, they are sensitive to sudden temperature changes while under the welding flame. Consequently, in welding such castings they must be carefully preheated, welded while hot and allowed to cool slowly. Like cast aluminum, Monel castings have very little strength when hot, so the piece must be properly supported in the pre-heating furnace so that the various parts of the castings will not collapse or distort under their own weight.

The casting should be brought to an even dull red heat of about 1,200° F., and the temperature maintained as steadily as possible during the welding. When the weld is completed, cover all openings of the pre-heating furnace with asbestos paper so that cold air does not enter; allow to cool slowly.

—P. W. BLAIR.

Sulphur Glaze on Bronze Molds

Q.—I Understand some hand-mold-casting concerns who pour molten metal into bronze molds coat the cavity with sulphur as a glaze. Do you know just what kind of sulphur to use and how to apply it? I imagine it is sprayed or lightly painted in the mold cavity, dried, then fired to fuse the sulphur as a glaze or coating.

A.—We have no information as to the use of sulphur for bronze mold coating. However, it appears there may be something in it, and in the near future we will make further investigation and possibly some tests, and will be pleased to advise of our results.

We do know smoking is used with success on bronze molds, using kerosene oil to smoke them. Acetylene gas is also very good. It may be that sulphur can be sprayed on and burnt off, leaving a skin that may be used a number of times without applying a coating. This, however, is just our thought. When convenient we will get to work on this question.

—W. J. REARDON.

Smelting Lead Battery Plates

Q.—We are seeking information as to the use of a stationary reverberatory furnace specially lined with alumina brick for running down battery plates. Can the antimonial lead obtained from the battery plates be softened into soft lead? If so, please give us full information, mentioning fluxes. The furnace is oil fired.

A.—We presume that your point is whether antimonial lead obtained from battery plates can be softened into soft lead.

Antimony can be removed from lead to some extent in a reverberatory furnace, but not entirely, by heat and flux. The flux should contain approximately 32 per cent silica, 26 per cent iron and is made approximately as follows:

	Pounds
Soda ash	15
Silica sand	75
Fluorspar	50
Coal dust	200
Lime	50
Iron scale	100

Mix about 20 per cent of the above mixture with your charge of battery lead. To remove antimony and other elements from the lead, as soon as the furnace is full and good and hot remove the first skimming. After this has been removed, the firing is increased and there soon rises a light vapory smoke. At a cherry red heat, oily drops appear floating on the surface. These rapidly multiply with increase of heat. Soon the entire surface will be covered with antimony of lead.

Now let the furnace cool and remove antimony skimmings. Frequently take a sample with a ladle. Use a mold for the samples. The surfaces are carefully observed as the operation progresses awhile. First, a crystalline coating is seen during solidification. The hardness is determined by the size and whiteness of the coating. The coating is characteristic of antimony. As the quantity grows less, the white frosty elliptical spots grow smaller. At the moment of complete solidification, the center shrinks, forming a permanent depression.

The success of subsequent operations depends upon the completeness with which the antimony is removed. There is always lead in the skimmings of the antimony. This can be re-run and sold for antimonial lead.

Part of this information is obtained from "Lead Smelting," by Iles.

—W. J. REARDON.

Blast Furnace Tuyres

Q.—Please give us the proper alloy for blast furnace tuyres.

A.—Blast furnace tuyres are made from copper as pure as possible. The general practice is to use phosphor copper as a deoxidizer, which is made of 99½ per cent copper and ½ per cent of 15 per cent phosphor copper.

If you can use less phosphor copper it will better the life of the tuyre in the furnace. It is best to add ¼ per cent of the phosphor copper and take a test by dipping out a small amount in an iron ladle and pouring in a slug—say 2¼ in. thick and 4 in. long. This slug is made by taking a sprue cutter of the above diameter and pushing it in the sand 4 in. deep. If properly deoxidized the metal will go down. If not it will rise out of the mold. More deoxidizer must be added in the latter case until the test shows the metal is deoxidized and shrinks down in the test.

—W. J. REARDON.

White Metals, Brasses and Bronzes

A Series of Articles Describing the Types, Constituents, Properties and Methods of Making a Wide Variety of Mixtures as Practiced in a Large Casting Plant—Part 2*

By E. PERRY

Consulting Chemist, Oakland, Cal.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Grades of Bearing Metals

The anti-friction bearing metals, like all other alloys, are made according to standard formulas and usually are graded in accordance with the amount of tin and copper they contain. A "hardener" consisting of tin, copper, and antimony is usually made up as a stock alloy, and because this hardener has a comparatively low melting point all of the different grades of Babbitt may be made in an ordinary melting pot at a temperature not exceeding red-heat. The "hardener" consists of the following:

Copper	4 lbs. or 16.67%
Antimony	8 lbs. or 33.33%
Tin	12 lbs. or 50.00%

The copper is melted first, then part of the tin—usually one-half—is added to the melt and mixed by stirring, after which the surface of the molten metal is covered with charcoal; then the antimony is fed in gradually, and when that has melted the remainder of the tin is added. Finally the alloy is run into one-pound ingots. With the above hardener any desired grade of tin bearing metal may be made by using a proper amount of the hardener with a certain quantity of either lead or tin, or of both metals. The mixtures are calculated by rule, and the alloys produced generally correspond to the theoretical composition.

In addition to the "hardener" just given, it is customary to have on hand a supply of "antimony-lead" for letting down or cheapening some of the grades. Such an alloy consists of lead—80 per cent, antimony—20 per cent. About one-half of the lead is melted and brought to a red-heat, the melt covered with charcoal, then the antimony introduced in small portions. When all of the antimony has dissolved, the remainder of the lead is added. Because some of the antimony is lost in melting, it is customary to allow for such loss, therefore 21 per cent of antimony is generally used in making this hard-lead alloy. With the "hardener," the "antimony-lead," some phosphor-tin or phosphor-copper, and a stock of ordinary tin and lead, it is possible to make any desired grades of Babbitt metal. For instance, in making an improved Magnolia metal the following alloys and metals could be used:

Constituents	Tin	Anti- mony	Lead	Copper	Phosphorus
5 lbs. "Hardener"	2.50	1.67	....	0.83	.... per cent
3 lbs. Phosphor-Tin	2.91	....	....	....	0.09 per cent
65 lbs. "Antimony-Lead"	13.00	52.00	....	....	.... per cent
27 lbs. Lead .....	....	27.00	....	....	.... per cent
100 lbs.	5.41	14.67	79.00	0.83	0.09 per cent

Phosphor-tin is figured to contain 3 per cent of phosphorus and 97 per cent of tin. A standard high

grade Babbitt would be made in similar manner on the following formula:

	Tin	Anti- mony	Copper	Phosphorus
22 lbs. "Hardener"	11.00	7.33	3.67	.... per cent
10 lbs. Phosphor-Tin	9.70	....	....	0.30 per cent
68 lbs. Tin	68.00	....	....	.... per cent
100 lbs.	88.70	7.33	3.67	0.30 per cent

As a rule, "hardeners" and "antimony-lead" are made up according to the ideas of the individual Babbitt manufacturer, and may contain any desired percentages of antimony, tin, copper, and lead. Occasionally and in some special mixtures, hardening alloys containing nickel, aluminum, etc., are used. Phosphorus is a valued addition to the bearing alloys. It eliminates occluded gases, oxides and other impurities, insuring a dense and close-grained metal which will stand more pressure and pounding than a coarse crystalline alloy. It lowers the melting point of the alloy several degrees but not enough to cause melting-out of the bearings in service, and as it tends to prolong the life of the molten metal by keeping it fluid there is less trouble in pouring the castings. Alloys containing phosphorus, on remelting, lose a certain amount of phosphorus each time, and at the third or fourth remelting most of the phosphorus will have been burned out; therefore in such cases it is customary to add a small quantity of phosphor-tin in the bottom of the kettle before remelting. Phosphor-tin is somewhat difficult to melt, and generally rises to the top of the molten metal. The only objectionable feature about phosphorus is that it attacks iron most readily, and the kettles and ladles soon become coated with a black slag.

Much has been claimed about Babbitt metal being made from old and new metals, that providing the chemical composition is the same there should not be any difference in the physical properties whether the alloy is made of dross and scrap or of new metal. If this was founded on fact the United States Government and large industrial consumers would not specify as they do "new metal." For example, in the Government formula for genuine babbitt metal it is specified that it shall contain 88.9 per cent tin, 3.7 per cent copper, 7.4 per cent antimony, and reliable makers show this composition molded in the bar. The facts of the proposition are that if scrap metal is refined to such degree that all oxides and other impurities are removed, then old metal would be equal to new; but it is difficult to refine some of the metals. Lead is easily refined, but copper and tin are more difficult and the operation is expensive. Chemical analysis does not detect the presence of old metal, but the microscope furnishes a fairly good method of conjecture as to the presence of such material.

Babbitt metal is bought by the pound, and a certain

* Part 1 appeared in our issue of September, 1929.

number of cubic inches of the alloy are required for a bearing; therefore the actual comparative value should be figured on the cost per cubic inch. For example: ordinary cheap Babbitt may weigh 5.98 ounces per cubic inch, whereas genuine high-priced Babbitt weighs approximately 4.28 ounces per cubic inch. For easy illustration, the price may be given as 6c per pound for the cheap grade and say 48c per pound for the better grade; then their ratio of cost per pound is as 1 to 8, but if the cost per cubic inch would be 2.24 cents and 12.84 cents, respectively, per cubic inch, then comparative values are approximately 1 to 6. All bearing alloys high in lead have high specific gravity, consequently weigh more to the cubic inch than the light specific gravity metals. The specific gravity of a metal multiplied by 0.577 gives the weight in ounces avoirdupois per cubic inch. In similar manner, the specific gravity multiplied by 0.036 gives the weight in pounds or decimal parts of a pound, per cubic inch of the alloy.

A List of Bearing Metals

A few years ago the American Society for Testing Materials published an excellent list of standard alloys which are to be recommended to anyone interested. The following formulas represent as characteristic types the principal bearing alloys in general use by large industries for their own special requirements and also for use in their products. The needs of modern and advanced machinery demand scientific selection of just the right bearing metal furnishing the lowest co-efficient of friction as conducive to maximum service at minimum cost. In the table herewith, all quantities are given in percent so that comparison of differences may be made more readily:

Type of Metal	Tin Sn.	Antimony Sb.	Lead Pb.	Copper Cu.	Phos. P.	Misc.
1—Vanadium Babbitt	90.00	7.50	....	2.40	....	0.10 Va.
2—Nickel Babbitt	90.00	6.00	....	2.75	....	0.25 Ni.
3—High-Pressure-Speed	89.50	6.75	....	3.60	0.15	....
4—Journal Babbitt	85.50	13.00	....	1.50	....	....
5—Heavy Pressure	85.00	7.50	....	7.50	....	....
6—Special Crank Pin	85.00	2.50	7.50	5.00	....	....
7—Phosphor-Babbitt	85.00	5.00	7.50	2.25	0.25	....
8—Heavy Pressure	80.00	7.00	9.00	3.85	0.15	....
9—No. 1 Journal	75.00	12.00	10.00	3.00	....	....
10—Locomotive Babbitt	60.00	12.00	24.00	4.00	....	....
11—High Speed Babbitt	50.00	12.00	37.00	1.00	....	....
12—Hard Babbitt	50.00	7.50	41.00	1.50	....	....
13—Half and Half Journal	48.00	2.00	48.00	2.00	....	....
14—Medium Heavy Pressure	44.00	6.75	47.00	2.00	....	0.25 Fe.
15—Journal Babbitt	40.00	10.00	48.00	2.00	....	....
16—High Speed	39.00	8.00	52.00	0.75	0.25	....
17—Soft Babbitt	35.00	5.00	60.00	....	....	....
18—Standard Transmission	20.00	5.00	75.00	....	....	....
19—Transmission Bearing	12.50	17.00	70.00	0.50	....	....
20—Railroad Bearing	10.00	10.00	80.00	....	....	....
21—Special Engine Bearing	8.25	12.25	79.50	....	....	....
22—Anti-friction Journal	6.50	8.00	85.00	0.50	....	....
23—Rolling Mill Heavy Pressure	6.00	15.00	77.00	2.00	....	....
24—Car Journal Bearing	4.00	12.00	84.00	....	....	....
25—Eutectic Alloy .....	....	13.00	87.00	....	....	....

The following will exemplify, in part, certain features to be embodied in purchase specifications, as for instance:

No. 3—a special alloy designed for use on bearings subjected to heavy pressure, high speed, and excessive pounding. It should be made entirely of refined metals. No objection to be made to the use of copper wire providing it is free from oxide, arsenic, and sulphur, but tin scrap and antimony scrap are not permissible. The original metal is usually made with the addition of 0.10 per cent of aluminum introduced

with the copper in the "hardener," but this is lost in the melting. Aluminum is used as a de-oxidizer. The phosphorus may be introduced in the form of phosphor-copper or phosphor-tin. The metal will have a specific gravity of about 7.425, and a cubic inch of the alloy will weigh 4.28 ounces. The metal will melt at about 450° F. The compressive strength or resistance, using a cast cylinder $1\frac{1}{8}$ inches in diameter and exactly $1\frac{1}{2}$ inches long, will require a pressure of about 20,500 pounds to reduce the upright cylinder to a height of one inch.

No. 8—to be used for bearings subjected to extremely heavy pressure under medium high speed. Similar specifications as for No. 3 will apply, with these variations: Specific gravity about 7.650, and a cubic inch will weigh 4.42 ounces. Melting point will average about 400° F. The resistance to impact (pounding), using a cylinder 1.125 inches in diameter and 3 inches long, will range from 26,676 to 28,080 inch pounds.

No. 25—Is sometimes called double-refined antimonial-lead, and is used for unimportant bearings not subject to excessive impact, and also is used as a "backing" or filling metal. Specific gravity about 10.464, and a cubic inch will weigh 6.04 ounces. Melting point is 443° F. The "hardness" of the alloy will vary considerably, as the least amount of arsenic renders it extremely hard; therefore the metal should be reasonably free from arsenic, not to exceed 0.10 per cent. Resistance to impact is very variable, influenced by slight variations in its lead content, and the temperature at which it was poured.

The particular impact tests alluded to consisted of subjecting a cylinder of the metal to repeated blows

(180 per minute) of a 26-pound trip hammer with a drop or fall of 6 inches, for exactly one minute or until the metal cracks or crumbles. Each blow of the trip hammer was calculated as being equivalent to 156 inch pounds. The metal must withstand such pounding without the flattened section being separated from the unhammered part. The results depend first upon the temperature at which the metal is poured; second, the fineness of grain; third, the presence of phosphorus or other de-oxidizing agents.

This series will be continued in an early issue.—Ed.

Non-Ferrous Alloys Help Make the World's Fastest Ship

WHEN the new North German Lloyd liner Bremen crossed the Atlantic recently in the world's record time for ocean travel, it was heralded as the new queen of the seas, supplanting in this position the Cunard liner Mauretania, which had held the record from some twenty-two years. The Bremen cut the time to less than five days, due, it is said, to unique design and other ultra-modern ideas of its builders. Among the many features which make this ship the last word in comfort and speed is the wide use of the non-corrosive alloy, Monel metal, for a very great variety of purposes. Every effort has been made to make this ship beautiful, luxurious. From stem



North German Lloyd Liner "Bremen"

to stern and from keel to funnel she represents every art and device of the ship and hotel builder of the twentieth century. Her two stacks are each large enough to slip easily over an ordinary four-story building; her hull is shaped to press water down under the ship rather than to the sides, to which idea is attributed some of her great speed. Efforts have been made to cut wind resistance down to a minimum. The smoke from her oil burners reaches the funnels through the sides of the ship rather than up through the center, permitting her to have spacious ballrooms, swimming pool, gymnasium, night club, etc. The modernistic decorative scheme is of surpassing beauty.

Naturally, large amounts of copper and brass have gone into the Bremen's construction. Some of the standard uses for copper, brasses and bronze in liners are: propellers, electric cable and wire, worm gears, bearings (these also require lead, tin, copper alloys, babbitt metal, etc.), condenser tubes, control apparatus, binnacles, hardware, fittings, etc.

The sister ship of the Bremen will be the Europa, now under construction in Germany. Some idea of the magnitude of these shipbuilding operations of the North German Lloyd may be gained from the fact that the two vessels together contain more than 5,700,000 pounds of copper and its alloys, brass and bronze.

The Europa will have nearly 600,000 pounds of copper and about 560,000 pounds of bronze for pipes and armatures alone. Electrical installations in the Bremen include about 415,000 pounds of copper. The main ducts used for pipes in the main engine rooms, the boiler rooms and the auxiliary engine room of this vessel contain about 400,000 pounds of copper and 273,000 pounds of bronze.

For cable insulation and also for certain other purposes, lead is almost indispensable. Considerable zinc is used on galvanized parts. To a great extent these have not been replaced by any other material, but for some of these uses, as shown in the construction of the Bremen, the marine engineer has been looking upon Monel with increasing favor, due, no doubt, to its high resistance to corrosion.

Special attention has been given to kitchen layout and equipment. Every device, mechanical and electrical, to expedite and improve kitchen operation has been introduced. Among these are bright Monel metal food tables, serving tables, steam tables, shelves, etc.

The gigantic power plant which drives this 50,000 net ton ship at 29 knots represents the ultimate in European marine power development. There are four powerful turbines with four huge screws, each operating independently. Two widely separated groups of boiler rooms are provided to gain safety in the event of collision or other mishap. The turbine blades and steam valves, which must withstand terrific strain and corrosive action, are of Monel. Other engine room facilities are of Monel as well. The control board illustrated here has a great deal of this alloy on it.

The Huntington, West Virginia, plant of The International Nickel Company, supplied more than 35 tons of Monel metal for use in the Bremen. A similar amount, possibly more, will go into the Europa, sister ship to the Bremen, which is rapidly nearing completion. Her construction was hampered by a serious fire which occurred while she was being built.

On both ships, Monel metal serves a number of diversified purposes. The swimming pool, for instance, has considerable Monel for essential as well as decorative parts. In various forms, the Monel was supplied by the following German firms:

Paul Leistritz, A.-G., Nuremberg, purchased a total of 41,800 pounds for the manufacture of turbine blading.

Isolation A.-G., Mannheim, Neckarau, supplied 9,360 pounds of finished blading.

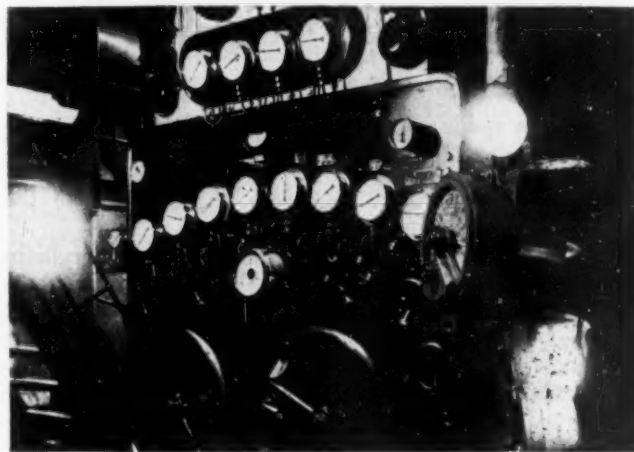
Thelen and Rodenkirchen, Köln-Niehl, fitted 2,860 pounds in the kitchens and pantries and 2,640 pounds in the swimming pool.

E. Alisch and Company, Berlin, S. 14, used 190 pounds of sheet for table tops, pressed covers for ice cream containers, and trim.

Sächsische Bronzewarenfabrik A.-G., Wurzen, used 120 pounds for lamps in the swimming pool.

Visswerke Aktiengesellschaft, Sartedt, used 400 square feet of Monel metal mesh, weighing about 144 pounds, as screens for grills and toasters.

Deutsche Schiff-und Maschinenbau, A.-G., Werk "Weser", Bremen, builders of the vessel, purchased from



Engine Room Control Board on the "Bremen"

Monel Metall Gesellschaft, the following: 12,200 pounds of full finished sheets and strips; 1,220 pounds of solid drawn tubes; 515 pounds of split tubes; 95 pounds of wood screws. (The information in this article was obtained from "Inco," published by the International Nickel Company; from the technical department, North German Lloyd; and the Copper and Brass Research Association).

The Possible Use of Beryllium in Aircraft Construction

A Metal With an Interesting Future

By Dr. H. W. GILLET

Director, Battelle Memorial Institute, Columbus, Ohio

A PAPER PRESENTED AT THE MEETING OF THE AMERICAN ELECTROCHEMICAL SOCIETY, HELD AT PITTSBURGH, PA., SEPTEMBER, 1929

A SYMPOSIUM such as this should look toward the future as well as at the past and present. While little can be said with definiteness on the subject, it is at least worth while to bring up for discussion the question whether beryllium may not in time take its place beside aluminum and magnesium for aircraft construction.

It is known that the metal is light, having a specific gravity of about 1.84, practically the same as magnesium. It has a high melting point, about 1260° C. Its modulus of elasticity is almost up to that of steel, being about 27,500,000 pounds per square inch (2,000,000 kg. per sq. cm.). Its coefficient of thermal expansion is approximately that of cast iron. In ordinary air it retains a high polish indefinitely. In salt water it is probably attacked more readily than pure aluminum, but far less than magnesium. It is hard and rather brittle, not amenable to cold-working.

Much work has been done on alloys of heavy metals containing a little beryllium, since alloys of it with iron, copper or nickel are heat-treatable. The aluminum beryllium alloys, low in beryllium, appear to be uninteresting.

Very little has been done, and few details published, on alloys high in beryllium, but there are interesting indications in the high beryllium end of the aluminum-beryllium system. The specific gravities, elastic moduli and thermal coefficients of expansion are roughly those calculated from the properties of the pure metals. No data are available on corrosion resistance of such alloys. About all that is known as to strength is that thin sheet rolled from an alloy of 70 per cent beryllium, 30 per cent aluminum has a tensile strength of 70,000 to 100,000 pounds per square inch, (5,000 to 7,000 kg. per sq. cm.) which is a figure that may properly excite interest in so light an alloy.

The commercially pure metal apparently finds, so far, but one commercial use, as a window in X-ray tubes, since it is extremely transparent to X-rays. These tiny windows are made by hot-pressing. It will evidently be necessary to resort to hot-working to fabricate the metal itself, as even the purest metal is too brittle for cold-working. Alloying with aluminum should improve the cold-working properties.

The metal and the aluminum alloys high in beryllium are hard to cast free from blowholes, and special technique would have to be worked out. On account of the hardness, high melting point and suitable thermal coefficient of expansion, it ought to make a good piston to operate against nitrided steel cylinders, for example, if it could be cast.

The really outstanding property of beryllium is its high modulus of elasticity, which is nearly three times that of magnesium. It would be outstandingly better as a spring than the other light metals, and would far outclass them for such parts of aircrafts as are desired to have low elastic deformation. Were such a light metal with such an elastic modulus commercially available, aircraft designers could use methods of construction now impossible. Nothing is known of its endurance properties, so its possible suitability for propellers cannot be estimated.

On account of the high cost of the metal, which has been around \$200 a pound, no one has gone far with the study of the metal itself, or of alloys high in the metal. With aircraft application as the outstanding possibility for quantity use, and the fact that it is worth \$40 to reduce the weight of an airplane one pound, the statement of the producers of the metal both here and abroad that, with any real quantity demand for it, the cost could be brought down to somewhere between \$25 and \$50 a pound immediately, with progressive further reductions in the future, makes it seem like a good business investment to look into the high beryllium alloys.

Hesitation to pay present prices for metal for experimental purposes is probably due fundamentally to the idea that beryllium is a rare metal, and could not be obtained in quantity. As a matter of fact, geologists estimate that there is as much beryllium by weight in the earth's crust as there is lead or zinc, and a whole lot more by volume.

Deposits of beryl are known from which prompt commercial shipment could be made. With a reason for prospecting for beryl, beryllium would soon get out of the rare metal class, in the minds of the public, as well as in fact, just as molybdenum did.

What is needed is information on the feasibility of forming it into sheets, tubing, forgings and castings. Were the material available in a shape the aircraft designer could use, he would certainly try it. This need for data on fabricability is the neck of the bottle in the whole situation.

So far the producers have been too busy working out methods of winning the metal from the ore to get around to the study of properties and fabrication. This study must be made before it can be told whether the high beryllium alloys are or are not future possibilities for aircraft use. No organization, which has the money to finance the necessary work, seems to be interested, and those who are interested lack the money to finance it. When the aircraft industry gets a bit more organized and oriented, so it can look beyond the rush of production of aircraft from present day materials, and can enter a period of research for improved materials of construction, the subject will doubtless be taken up and the essential facts determined.

Until engineering data prove that beryllium is not suited for aircraft construction, without regard to its price, it appears that it should be kept on the list of possibilities. The writer knows that some metallurgists, who should be in a position to judge, are pessimistic as to the future of beryllium, while others, concerned with its development, are optimistic. Having himself only an academic interest in the matter, and looking at the subject from a detached point of view, the writer is inclined to side with the optimists, and to predict that in some future symposium on this subject beryllium will be discussed as an actual, rather than a potential material for aircraft construction.

It will not be so classed, however, until someone spends some money in the study of light alloys consisting primarily of beryllium, instead of on heavy alloys containing a little dash of the element.

Utilization of Secondary Metals in the Foundry

The Value of Scrap Metals in the Red Brass Foundry. Operations Involved in Their Use

By H. M. ST. JOHN

Metallurgical Editor

FROM A PAPER READ AT THE MEETING OF THE INSTITUTE OF METALS DIVISION IN CLEVELAND, OHIO, SEPTEMBER, 9-12, 1929

LIKE every present-day manufacturer, the brass foundryman is faced with the necessity of reducing the cost of his finished product without impairing its appearance or quality. He must use every economy that the progress of art and science puts at his disposal and should also be alert to profit by any peculiarity in his own situation or the nature of his product that may give him an exceptional advantage.

Much can be accomplished by the adoption of labor-saving equipment and improved methods of melting, molding and handling. Control of pouring temperature, study of defective castings and their causes, laboratory control of molding sand and core mixtures, the use of less expensive alloys, all contribute to the desired end. Assuming that the composition of the alloy is already as inexpensive as the character of the casting will permit, still further savings can be made by the intelligent purchase and utilization of the metals needed to produce the desired analysis.

Functions of Secondary and Virgin Metals in Casting Brass

It is no longer a general assumption among foundrymen that quality castings must be made from an "all virgin" mix. If suitable secondary metals can be obtained more cheaply, it is wasteful to use any larger proportion of virgin metal than is required to produce castings of the desired properties. To follow such a course, however, imposes upon the foundrymen a heavier obligation than was formerly the case, to make sure by test and inspection that his castings really are of the desired quality. So long as he used the most expensive grades of metal and his melting practice was reasonably correct he was not obliged to give much thought to the quality of the metal in the castings. If he is to use secondary metals he must, in order to retain the confidence of his customer, examine these metals very carefully before use, exercise scrupulous control over his melting and pouring conditions and examine his castings closely.

These statements apply more particularly to the jobbing foundry. The foundry department in a manufacturing plant is in a somewhat more favorable position with respect to competition. However, a saving made in the foundry is a saving in the cost of the finished product, regardless of whether castings are purchased or made at home, and there is no good reason why the foundry department should not operate as economically as a jobbing foundry; in fact, there are a number of reasons why the foundry department is in the best possible position to make a maximum use of secondary metals. For one thing, other departments of the same plant are frequently a convenient and reliable source of supply for some of these secondary materials, which would otherwise have to be sold to a dealer. Then, too, when the foundry's customer is under the same roof, the behavior of the castings as they pass through the shop can readily be observed and any defects in the metal can quickly be determined and corrected, without loss of business or fatal damage to the foundry's reputation.

An important reason for using a certain proportion

of virgin metal in the foundry mix is to obtain a high degree of fluidity in the molten metal, or give the metal "life," so that intricate shapes can be poured without misruns, and uneven shrinkage due to sluggish metal may be avoided. This is principally a function of the new copper. There are other means of enhancing fluidity, such as the addition of phosphor copper or other deoxidizers, the use of a small percentage of nickel, etc. The method of melting also has a bearing on this problem and it is rather likely that the increasing use of electric furnaces has diminished the brass foundry's virgin-copper requirements. If the necessary degree of fluidity can be maintained without addition of virgin metals, there seems to be no good reason why secondary metals should not be used, provided, of course, that these contain no directly detrimental impurities.

As a matter of fact, secondary copper, lead and zinc are extensively used by red brass foundries. The percentage of tin in the alloy is commonly so small and its influence so important that the use of secondary material, even if readily obtainable, is not so profitable as to make the practice common. However, a good quality of high-tin turnings can often be used to advantage in the production of castings having a lower tin content.

Selection and Treatment of Turnings and Borings

Among the alloyed materials that may be purchased, the most important is composition turnings or borings. If sufficiently clean and of suitable analysis these may often be used directly in the foundry melt along with brass turnings produced in the plant's own machine shop. Otherwise they form a convenient material for the manufacture of ingot. The proportion of oil, moisture, free iron and solid non-metallics in the turnings should be carefully determined and their presence allowed for in calculating the price which the foundry can afford to pay. The turnings should be analyzed and rejected if they contain aluminum, either free or combined, unless the foundry is in a position to remove the aluminum by refining. Other impurities, in reasonable amount, can be taken care of in the ingot-making process.

Practically all brass turnings contain some free iron and many carry appreciable percentages of oil and moisture. The iron should be removed by passing the turnings through a magnetic separator, which every foundry should possess for the treatment of turnings from its own shop or from its customers. A variety of dryers, commonly home made, are used for eliminating oil and moisture. One type of dryer, recently placed on the market, conveys the turnings through a furnace chamber heated by gas burners so adjusted so as to avoid entirely an oxidizing atmosphere within the furnace. The oil is removed largely by distillation and to some extent the vaporized oil is burned within the furnace to supplement the heat supplied by the gas burners. Completely dry turnings, comparatively free from surface oxidation, can be obtained cheaply in this manner. If the turnings are eventually to be melted in an electric furnace, complete removal of oil is of the utmost importance.

Rod-brass turnings, particularly if available within the plant, may profitably be used by the foundry. These should pass through a centrifugal dryer before leaving the screw machine department, after which their oil content should not exceed 1.5 to 2.0 per cent. This residual oil may be removed in a furnace dryer. After passing through a magnetic separator, the turnings are ready for use. If the drying is carried out so as not to oxidize the surface of the turnings appreciably, they are entirely suitable for use directly in the foundry melt, with a corresponding saving in the amount of composition ingot used.

Utilization of Composition Castings and Wrought Metal

The utilization of composition scrap castings is a matter requiring specialized experience and skill. The analysis of this class of material is subject to infinite variation and there is no adequate method of sampling without first melting. Scrap castings should be carefully sorted and classified before melting; even then it is easy to go wrong. For this reason such miscellaneous scrap is not suitable for foundry use.

Composition wrought metal, whether in the form of clippings, punchings, etc., or wornout metal articles such as automobile radiators, can be purchased of uniform composition and such material may often be used economically. Its successful use is a matter of good judgment and careful inspection. The presence of free iron should be avoided because the magnetic separator will not handle this material. Allowance should be made for the presence of solder, which should not be excessive.

Treatment of Light and Small Scrap

The ashes, slag, skimmings, etc., produced by the foundry should be crushed and concentrated. A convenient method is to put this material through a ball mill that discharges its fines directly to a Wilfley table or similar device. The coarse metal that will not pass through the trommel of the mill may be used directly in the foundry melt or in the ingot-making furnace. The table can be adjusted so as to recover practically all of the metal from material of this class. The table concentrate, averaging 80 to 90 per cent, metallic, is ready for ingot making as soon as it has been through the magnetic separator. The middlings, usually less than 50 per cent metallic, should be fed back to the table for retreatment.

Foundry floor sweepings, containing the metal which has been spilled and spattered during the pouring of the molds, can advantageously be screened dry, before concentration by a wet method. A two-deck vibrating screen, using 10 or 12 mesh on the upper deck and 30 to 40 mesh on the lower deck, will separately deliver two concentrates, the coarser of which should assay 75 to 85 per cent metallic and be fit for ingot making without further concentration. The finer concentrate, averaging about 50 per cent metallic, should go to the ball mill and table for additional treatment. The fine molding sand, which has passed through the 40-mesh screen and is almost free from metal, can often be blended with raw molding sand for return to the foundry heaps. The vibrating screen should be enclosed and equipped with a fan and dust collector; this not only avoids a serious dust nuisance but also removes the extreme fines, which would tend to make the salvaged molding sand too close for successful use in the foundry.

These statements refer only to such materials as originate in the foundry or in the plant of which the foundry is a part. It does not pay to compete with the smelter in the open-market purchase of such small scrap. Occasionally, perhaps, but rarely, it may be worth while

to buy rich concentrated material of known composition from outside sources.

Buffings and grindings that originate in the plant may satisfactorily be used in the foundry department. If richer than 60 per cent in metal content, they can be used directly in ingot making; if leaner than 60 per cent, it may be necessary to concentrate them on the Wilfley table, and in this case they should go through the ball mill first, not for grinding but to be thoroughly mixed with water. Even when wet the metallic particles in buffings and grindings are so finely divided and so light that a large proportion will find their way into the table tailings. Wasteful as this may appear, it is usually more economical than to dispose of the material by sale to a smelter.

Ingot Making in the Foundry

In many cases the foundry, particularly the foundry department of a manufacturing plant, can profitably produce composition ingot for its own use. This does not mean that the foundry can economically compete with the secondary smelter and refiner in collecting and refining miscellaneous scrap materials and metal-bearing wastes of unknown composition. It does mean that an establishment producing within its own walls substantial quantities of scrap materials and metal-bearing wastes which it would otherwise sell to the junkman or the refiner can frequently make use of these materials, supplemented if necessary by secondary metals of known composition and definite character purchased in the open market, to manufacture composition ingot of good quality for use in its own foundry. As the ratio of metal purchased outside to the metal originating in the plant increases the operation usually becomes less profitable.

The ingot-making department should be a separate division of the foundry. Furnaces used in regular foundry production should not be employed for this purpose. Almost any hearth-type of furnace may be used, provided its melting chamber is comparatively large and readily accessible for slag-skimming purposes. The rocking arc-type of electric furnace has some advantage in that it keeps its charge agitated and, by virtue of its neutral atmosphere, recovers most of the zinc, which would be oxidized in a fuel-fired furnace. It also lends itself to certain very effective refining methods that cannot be carried out so well in conjunction with oxidizing atmospheres and stationary baths.

Materials available for ingot-making charges will normally consist of rich concentrates, both wet and dry, buffings, grindings, rod-brass turnings, clippings and other wrought brass or bronze scrap and composition turnings purchased from outside sources. These materials should be blended in such proportions as to produce an ingot of analysis which can conveniently be used in the foundry. It is not necessary that the ingot should have exactly the composition of any of the foundry alloys—this would often require the addition of copper and other elemental metals which can more effectively and economically be added to the ingot when the latter is remelted for use in the foundry—but the ingot should be of such composition that it can be used for the production of the foundry alloys without adding excessive amounts of new metals.

The charge going into the ingot-making furnace should contain no free iron and should be free from oil or, in the case of the electric furnace, any other material that will leave a carbonaceous residue. Not more than 20 per cent slag-forming material should be included in any charge. In other words, the charge should not contain too large a proportion of comparatively low-grade concentrates, buffings or grindings.

Depending on the quantity and character of the non-

metallic materials in the charge, a varying amount of a fusible alkaline flux should be included with the charge. The author prefers soda ash. Borax or fluorspar can be used. The object is to make the siliceous slag sufficiently soft so that it may be skimmed readily, without making it soupy. A pasty slag, which breaks off in chunks when it is pulled from the furnace, is just right. The skimming operation should be performed through a wide open furnace door, using a long-handled hoe with a steel handle fastened to the center of the head, so that the hoe has four corners which can be used to clean out corners of the furnace chamber.

Refining in the Electric Furnace

The refining of impure non-ferrous metals in the electric furnace is a fascinating subject with many unexplored possibilities. It is known that both aluminum and combined iron can be wholly or partly eliminated by the use of an alkaline sulfate, such as anhydrous sodium sulfate or an alkaline earth sulfate such as barium sulfate. In either case the action is the same, the sulfate acting as a selective oxidizing agent and attacking the more

readily oxidized metals, while leaving the others, even the zinc, relatively unaffected. These fluxes can best be added to the molten metal in the furnace after skimming. The amount of refining done depends on the quantity of flux used, the temperature of the metal and the amount of time allowed after adding the flux. The use of an additional quantity of flux in the ladle when the metal is poured is of some benefit.

The brass will usually pick up some sulfur from a sulfate flux. This is commonly of little importance but may at times be injurious. The percentage of sulfur can be diminished by the use of soda ash in the ladle just as is sometimes done in the removal of sulfur from cupola-melted cast iron.

In the neutral atmosphere of an electric furnace the presence of finely divided carbon, originating from oil, for example, will result in the reduction of metallic silicon from the siliceous slag or from the furnace lining. Silicon is an injurious impurity in red brass, even when its percentage is 0.05 or less. It should be avoided but if present can be removed by the use of barium sulfate or sodium sulfate.

Melting Nickel-Chromium Alloy

Q.—I would like you to tell me by return mail if there is much difficulty in melting 2,000 to 3,000 lbs. of nickel-chromium.

The metal contains 86 per cent nickel and 14 per cent chromium and is in the form of borings. I am experienced in melting nickel in all grades but I have never handled chromium. I operate reverberatories, burning crude oil. I have obtained good results with this type furnace with nickel. I don't think I should have much trouble but I am not familiar with chromium. Do you know what flux is used for this metal? I will melt 1 ton or 3,000 lbs. at one time.

I know that borings, if put into a furnace in such quantities will cake up and require a lot of breaking up. I intend to use some ingot metal with these borings so I can get a bath of metal and then add until I have the whole 3,000 lbs. in the furnace at once. If I make a success of this melting we are to receive a contract for made?

Is this a found metal or is it a formula? I have melting 25 tons. If you care to tell me, how is chromium read considerable about the new plating with chromium but I never see anything about anodes used.

A.—We are of the opinion that you would have considerable difficulty in melting nickel chrome containing 86 per cent nickel and 14 per cent chromium in oil melting furnaces. This class of material is generally handled in the electric furnace. If you had a furnace similar to an open hearth we think you could do it. However, you say you obtain good results with nickel, so you must have a good furnace—one with a very high stack. I would not think you could melt nickel successfully in an ordinary reverberatory furnace.

The nickel people use very high stack and oil fire for melting Monel.

Off-hand we would advise against melting chromium nickel in a reverberatory furnace, but due to your success in melting nickel we are of the opinion it is worth trying, using limestone as a flux, with a little fluorspar.

—W. J. REARDON.

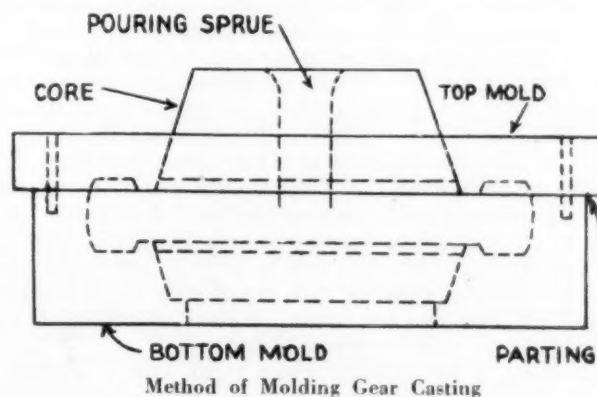
Chilled Bronze Gear Castings

Q.—We have recently had a number of inquiries, in fact we have several in hand, for chilled bronze gear castings, i.e., castings to be made with a three-sided chill on the teeth faces. We wonder if you have any data on the production of chilled gear castings and if you can pass same along to us?

A.—The purpose of chilling bronze gears is to prevent segregation. The chill is made in two pieces, top and bottom; dry sand core is used and gated from the inside through the core.

The mold is made as per sketch shown below. There is very little to the proposition, only getting sufficient gate and riser through the gate to take up the shrinkage. Use a smoked mold to prevent sticking and burning in.

The iron of which the mold is made should be cast iron



and should run high in graphitic carbon, 3% or over. The bronze lies better on iron high in graphitic carbon and low in combined carbon.

The process produces a fine-grained casting which machines readily and is said to give such longer life in service.

—W. J. REARDON.

A Brass Foundryman's Progress

How a Boy Grew Up to Be a Brass Foundryman. His Adventures, Joys and Sorrows, as Told to William J. Reardon.—Part 2.*

By OTTO GERLINE

Gerline Brass Foundry Company, Kalamazoo, Mich.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

DEAR Billy:—You certainly got me into a lot of trouble when you made that suggestion about writing this thing, how a kid worked himself up from 50c. per day in a brass foundry to what you seem pleased to call the successful owner of one. You seem to think that because I spent last winter in Florida and California, and am now spending a pleasant summer fishing, boating and camping in our beautiful state that I am rolling in wealth. Get this idea out of your head, Old Friend. I am not a Henry Ford, or even a John D., but I have enough to live on for the balance of my life (if nothing unforeseen happens) and I am of the opinion that it sometimes turns out to be bad practice to leave too much money to your wife and children when the time comes when you have "poured your last heat." Your wife may have a good time with it, with a second hubby, and that we wouldn't like, and the kids may forget to work and that ruins any good boy or girl, and, so I think, spend a little of your hard earned money with the wife that went through your early struggles with you, enjoy life a bit away from the fumes of a brass foundry, and not leave too much to your children, so as to spoil them for life's great battle.

Just about a year ago I was talking with Mr. Fred Crockett, a very good friend of mine about this very same thing. He said to me in reply, "Otto, I believe there is something to what you are saying, and in about two more years I will let up and take life more easy." Well, Mr. Crockett is dead, and buried. So that's that. Mr. Crockett was the general manager and part owner of the Star Brass Works of this city, inventor and manufacturer of the Star Trolley Wheel.

I had another friend, James Maher, a neighbor, whom I asked the day I left for the South, to turn his business college over to his son, and come south for a vacation. He said, "Next year I will be sixty years old, and then I may take your advice." I was in Miami a little over two months when I received a telegram from my sons saying that "Jim" had died. (He was 59 years and some months old.) You know that you and I are nearer to sixty than we are to sixteen, and so I am giving you a friendly tip, come down to Florida next winter and I will show you how to catch Sailfish, Barracuda and Tarpon in the Gulf Stream, and you will find that in fifty or less years from now no one will know or care whether you left \$100,000 or \$27,000, but you will know the thrill of pulling in one or more of the above-mentioned fish.

However, I am drifting away from what I started to do and that is giving you Part 2 of "our" autobiography, so here it goes.

After graduating from the "combination store" with somewhat doubtful honors, and several sore spots on my sitting apparatus, I started out to find another job.

My relatives did not seem very anxious to help me, and by this time I was very anxious to relieve them of what-

ever anxiety they may have had along these lines. In fact, I made up my mind then that I would never ask them for help again, and to this day I never have.

I found another job in a meat market at \$1.00 per week and board. This was strictly a meat market, that bought and sold dressed meats. No slaughterhouse connected with this one. I had only one horse and one light delivery wagon and one buggy to take care of. My other duties were, open the shop in the morning, clean out the place, look after the ice box, wash the windows, as well as the sidewalk, and start the fire in the kitchen stove for the Lady of the Ranch, and make myself generally useful until it was time to take orders from our customers, and later on deliver them. They had no phones in those days (at least we didn't) and the system was as follows: I was handed a list of customers and the address of each. I would call and ask about their requirements for the day and report to the "Lady Boss." She would get all these orders put up and marked for delivery, and I would take old Dobbin and the little delivery wagon and get busy. Our customers were mostly wealthy people (the poor people, as always, would have to go to the market and get their own, if they wanted any.) These people all had maids, cooks, butlers and hostlers, and I soon got acquainted with them, and got along splendidly with them all. Many a piece of pie and cake I got from these people, and I was in my glory. I got especially interested in the beautiful horses that most of these people owned, and the cleanliness that prevailed in their stables. Horses, harnesses and everything was right up to the minute. I tried to keep our old Dobbin and barn, etc., just like they did, and this made a hit with the "Man Boss" of the place, who, by the way, was a contractor and did not bother with the meat market.

They had three girls, and believe it or not, after my experience with my first love I promptly fell in love with the youngest of the three, a little blonde of about eleven summers. We got along splendidly together. I was treated like one of the family, called "our little son," and "our little brother," and then when the world looked rosy to me I made a fatal mistake. This mistake was simply anxiety to please, and ambition, but I got the worst of the deal. Of all the horses I admired, one I admired most, and that one belonged to Mr. William L. Scott, afterwards the Honorable Congressman William L. Scott, the man who made himself famous for his remark, "I would give a million for a new stomach." Maybe some of you remember him. This horse was a thoroughbred coach horse and kept groomed to the second, with a stylish Fifth Avenue bob, both tail and mane. I got the idea into my head that our old Dobbin would look much better with this coach horse bob, and henceforth proceeded to carry out the idea without consulting either one of my bosses. I borrowed the tools from Mr. Scott's hostler, and bobbed both tail and mane of my delivery horse. The horse didn't seem to care, in fact I think he liked it. Anyway, he looked pleased when I got the family looking-

*Part 1 was published in our issue for July, 1929

glass out of the kitchen to let him take a look at himself. I next gave him a bath with a hose, dried him off good, polished him up in good shape, blackened his hoofs with hoof dressing, polished the brass on the harness and hitched him up to the Sunday-go-to-church buggy for the Boss and the Mistress. I was a proud boy when I drove the horse up to the door, and told the folks everything was ready for their regular Sunday church trip. Mr. Pasket (the Man Boss) came out first. He took one look at the outfit, and then a look at me (me, with a grin all over my face). Then he turned pale and called his wife. I didn't like the look on his face, it was not a kind look. I lost my grin (a perfectly good one) and nervously awaited developments. They soon came. That man used language that no good Episcopalian should use, and had it not been for Mrs. Pasket hanging on to him a second, which gave me a chance to get a running start, I don't believe I would be here writing about it today. That man was angry, and I don't mean maybe. They walked to church that Sunday morning. He seemed to be ashamed to ride behind a "coach horse." He was not used to it like Mr. Scott was.

I stayed away two days and then went back after my few clothes, first making sure that Mr. Pasket was not at home. Mrs. Pasket told me then to come back, that everything was O.K. She said the boss laughed during the sermon, and all the way home from church. I don't know to this day whether it was the sermon or the bobbed horse situation that made him laugh. I never asked him. I can only remember him as he looked when he ran after me, as I went out through the gate, and I also remember that he was not laughing then. Besides my feelings were hurt. Here I go taking lessons from one of the best hostlers in the city, who handled some of the best horses in the city, that belonged to the most prominent man in the city, and I fixed up his darn old plug just like them and the thanks I get was that he would have murdered me if he could have run fast enough to have caught me. No, I would not go back. Besides, my little blonde had laughed when her Dad was chasing me through the gate. I could not stand for all of that and so I got another job from a Mrs. L. a widow, who also kept a meat market. This lady was a friendly competitor of my last employer, as well as a relative to Mrs. P. Here I went to work doing the same kind of work, and still smarting under what I considered my disgrace. I went to all my old customers with my story, and got most of them to buy their meat from us. Mrs. L. told me that in order to keep peace I should not get any more customers away from Mrs. P., or she would have to let me go. I cried like a little fellow would, who tried his best to make good and get hell for doing it, and so I resigned. Mrs. L.'s little girl, Pauline, told me that any boy that would try to make a coach horse out of a plow horse didn't know much anyhow, and perhaps that had something to do with my resignation.

It only took me one day to get a new job, and this one was also with a butcher. I was bound to be a butcher, and if I had met Mr. P. D. Armour about that time I am sure I would be a Vice President of that firm now, or perhaps a watchman at the stockyards. I don't know which, but anyway, this was a real job now. I signed an agreement to serve four years as an apprentice at the following wages:

\$50.00 per year and one pair boots, first year.

\$75.00 per year and one pair boots and one suit of clothes, second year.

\$100.00 per year, one pair shoes, and one suit of clothes, third year.

\$125.00 per year, two pair of shoes, and one suit of clothes, fourth year.

After that, journeymen's wages, which were about \$12 per week of seven days, 14 hours or more per day. As I could not ask my relatives, and had no legal guardian, some truant officer or something like that signed the papers for me. I was now tied up and could not resign in a hurry. We did our own killing here. Had four horses and plenty of work. As I am afraid that this butcher business will get tiresome to you, I will cut it short and simply tell you I learned to make sausage to some extent and got to be very handy helping in the slaughterhouse in a very short time. A woman also ran this meat market. Her husband was a select alderman of the city and work was beneath him. All went well for a few months, and then the regular butcher they had got drunk on a Saturday and the lady ran out of dressed lamb. She asked me if I thought I could kill a lamb. I said I didn't know. I had seen Ed do it but I never had done it. You perhaps know how lambs are killed for market. If you don't I will tell you about the way it was done in those days. In these private slaughterhouses, it was simply pick up a lamb, lay it on its back in a kind of sawbuck and cut its throat, you holding its head while it bled. I told the lady I would try, and went out into the pen to act as executioner. When I got out to the pen the little lamb ran up to me, trying to play. I rubbed its little head and then opened the door the pen that led into the death chamber. The little fellow followed me, licking my hand and playing. I knew then that I had a man's job on hand and had my doubts whether or not I was man enough to handle it. I finally got the little fellow on its back on the saw buck, and as it looked at me with those big round eyes of innocence I lost my nerve, or something went wrong inside of me. Tears came to my eyes and I picked up the lamb and put it back in the pen. I then got up enough courage to face the storm that I knew would break. I told the lady I could not and would not kill that lamb. She called me a baby and a boob and a lot of other fancy names that I thought at the time were not nice for a lady to use. She told me to pack my clothes and she would see to it that the officer would take care of me. I fooled the lady—I didn't wait for the officer. I took my little bundle and walked out into the country about seven miles, and got a job on a dairy farm, driving a milk wagon. And thus a good butcher was lost to the city, and I am afraid that we would all do without lamb chops to this day if I had to kill any of these innocent dumb animals, and stealing the words from Bert Williams will say, "Someone's got to do it, but not me, not me."

This series will be continued in an early issue.—Ed.

Turpentine Stains

Q.—I am sending you some spatulas which are made of very hard metal. In blanking out this produce, we use turpentine as a lubricant instead of oil. This causes considerable trouble, as stains form from the turpentine and the spots are difficult to remove. Can you suggest a solvent? A tumbling method of removing them would be best, as we have plenty of tumbling equipment.

A.—After experimenting with the samples we find that kerosene is the best solvent to remove the stains.

If you wish to try a tumbling method, we suggest that you use kerosene and sawdust. We believe that the stains can be eliminated by using pure turpentine, but not one of the many turpentine substitutes that are on the market.

—OLIVER J. SIZELOVE.

The Control of the Acidity of Nickel Solutions

How to Determine the Additions to a Solution of Definite Composition in Order to Control the Acidity Within Approximately 0.10 pH

By Dr. A. K. GRAHAM

Associate Editor

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THERE are two methods of controlling the acidity of nickel plating solutions. The most common one is to make empirical additions of acid or alkali until the desired pH is obtained. It requires experience with a given solution before one knows the approximate quantity of acid or alkali that must be added to change the pH a given amount, and for this reason it is impossible to advise another plater what addition he should make to adjust his pH to any desired value. Under any conditions a certain amount of experimenting is always necessary.

The second method is to titrate a sample of the solution with standard acid or alkali and an appropriate indicator, and then to calculate the additions required. Thomson¹ recommended the use of bromcresol purple because the color change occurs at the pH value most commonly used in nickel plating. He titrated a 50 c.c. portion of the nickel solution directly without dilution to a deep green color. The color change is not very definite, however, and it is therefore difficult for the average operator to determine the end point.

Sizelove² used methyl red as indicator, titrating a 10 c.c. sample of the solution to which about 90 c.c. of distilled water had been added. While the pH at which this indicator changes color is below that commonly found in nickel solutions and dilution of the sample would affect the values obtained, yet the end point is more readily detected and for this reason the results are probably

more reproducible. The method is based upon the fact that all good working nickel solutions are on the alkaline side to methyl red, and to take care of the difference in pH between the value at which the indicator changes color and the nickel solutions normally operates, the results are ingeniously expressed as the alkalinity to methyl red in terms of the number of c.c. of commercial ammonia per gallon of solution. One c.c. of c.p. sulphuric acid reduces the alkalinity of the solution by an amount equal to 2.5 c.c. of commercial ammonia per gallon.

According to this method the number of c.c. of N/10 acid $\times 2.52 =$ c.c. of commercial NH_4OH per gallon when 10 c.c. sample of nickel solution is taken for analysis. This calculation is based upon the following:

Commercial NH_4OH (sp. gr. 0.90) contains 28% NH_3

1 c.c. N/10 acid = .0017 gms. of NH_3

.0017 $\times 100$

1 c.c. N/10 acid = $\frac{\quad}{28} = 0.00607$ gms. of commercial NH_4OH

0.00607

1 c.c. N/10 acid = $\frac{\quad}{0.90} = 0.0067$ c.c. of commercial NH_4OH

commercial NH_4OH

1 c.c. N/10 acid = $0.0067 \times 100 \times 3.78 = 2.52$ c.c. commercial NH_4OH when a 10 c.c. sample of nickel solution is taken for analysis.

¹Trans. Am. Electrochem. Soc., Vol. 41, p. 333, (1922).

²Met. Ind., Vol. 24, June, July and Aug., (1926).

TABLE 1
Change of pH of Nickel Solutions on Titration with Standard Acid and Methyl Red.

1 Solution No.	2 NiSO_4 N.	3 NH_4Cl N.	4 H_3BO_3 M.	5 Other Salts N.	6 Original pH		7 Acid Added to 25 C.C. Sample of Nickel Solution ¹ C.C.	8 Final pH Neutral to Methyl Red	
					E.	C.		E.	C.
1	1.0	0.25	0.25		5.44	5.85	3.18	3.84	4.3
2	0.5	0.25	0.25		5.75	6.1	2.90	4.17	4.6
3	2.0	0.25	0.25		5.26	5.8	5.15	3.24	3.8
4	1.0	....	0.25		5.59	6.1	1.45	3.45	3.9
5	0.75	....	0.25	NiCl_2 0.25	5.61	6.1	1.38	3.65	4.2
6	0.50	....	0.25	NiCl_2 0.5	5.61	6.1	1.53	3.60	4.1
7	1.0	....	0.25	NaC 0.25	5.44	5.9	1.08	3.49	4.0
8	1.0	....	0.25	NaF 0.25	5.70	6.1	-2.13 ²	6.05	6.45
9	1.0	0.25	....		5.43	5.9	2.27	3.96	4.4
10	1.0	....	0.25	$(\text{MH})_2\text{SO}_4$ 0.25	5.46	5.9	4.05	4.20	4.6
11	1.0	0.25	0.25	MgSO_4 1.0	5.41	5.9	2.50	3.80	4.3
12	1.0	0.25	0.25	MgSO_4 2.0	5.47	5.9	2.72	3.60	4.15
13	1.0	0.25	0.25	MgSO_4 1.0	5.34	5.9	3.57	3.67	4.9
14	1.0	0.25	0.25	Na Citrate 0.5	5.48	5.85	10.30	4.10 ³	4.5 ³
15	1.0	0.25	0.25	CuSO_4 0.001	5.57	5.9	4.00	3.80	4.3
16	1.0	0.25	0.25	CuSO_4 0.01	5.41	5.85	2.83	3.52	4.1
17	1.0	0.25	0.25	ZnSO_4 0.001	5.64	6.1	4.70	3.67	4.15
18	1.0	0.25	0.25	ZnSO_4 0.01	5.66	6.1	4.72	3.82	4.3
					Av. 5.52			Av. 3.86	
					Max. Dev. from Av. 0.26			Max. Dev. from Av. 0.71	

¹Acid 0.0769 normal.

²C.c. of Alkali.

³Corrected for dilution.

If the normality of the acid being used is other than N/10 the above factor can be employed provided the c.c.'s of acid obtained in the titration are first converted to the equivalent of c.c.'s of N/10 acid. This is readily done by multiplying the c.c. of acid used in the titration by a factor equal to the normality of the acid used, multiplied by 10.

It is possible by any titration method to recommend definite additions of acid or alkali and to control a given solution at a fairly constant concentration of acid. However, it is the pH or hydrogen ion concentration with which one is concerned in nickel plating and since it has been reported that it is impossible to find an agreement between the pH and titration method of control this investigation was undertaken.

It was the writer's good fortune to have recently been one of a number contributing to a very complete study of the pH of nickel solutions and in order that those results might be used in this study, if necessity arose, the same nickel solutions were employed (See Table 1). The Sizelove method of titration was chosen as the most suitable. The pH measurements were made by both the electrometric method using quinhydrone and the colorimetric method using a LaMotte comparator with bromcresol purple color standards.

In titrating all solutions to the same color with methyl red one would expect to obtain the same value of pH at the end point, neglecting any differences in salt error of the indicator. The amount of acid required to neutralize solution having the same original pH would vary only with the buffer characteristic of the solutions. Two solutions having the same original pH and equally buffered would require the same quantity of acid. Similarly, two such solutions would have the same alkalinity to methyl red when expressed as c.c. of commercial ammonia per gallon.

The c.c. of (0.0769 N) acid required to neutralize 25 c.c. samples of the various nickel solutions were determined as the result of analysis and are recorded in Table 1, Column 7. Unfortunately, the pH of the original solutions were not all the same, but differed from the average value of 5.52 by as much as 0.26 pH unit (Column 6E) and, therefore, the c.c.'s of acid recorded are not a true indication of the buffer characteristics of the respective solutions. For this reason the solutions were grouped according to their original pH, Table 2, Series A to D, and the alkalinity to methyl red expressed as c.c. of commercial ammonia per gallon according to Sizelove's method. (Table 2, Column 3). In series A, B and D the values of alkalinity so expressed may be used to compare the buffer characteristics of the solution in any one series where the solutions have the same original pH. The three solutions in series C

cannot be compared because of the variation in the pH of the original solutions.

The calculated amount of acid (Column 7) was then added to 25 c.c. samples of the respective nickel solutions and the pH of the resulting solutions determined. Contrary to expectations, quinhydrone values gave a maximum deviation of 0.71 pH units from the average of 3.86 pH (Columns 6-E Table 1) instead of a constant value for all solutions when neutral to methyl red.

Fearing that the volume of acid added to the 25 c.c. samples (Table 1, Column 8) was sufficient in some cases to account for this wide variation, a set of samples was prepared by adding an equivalent number of c.c.'s of distilled water to 25 c.c. samples of the nickel solutions, instead of the standard acid. The pH of this series was then measured and compared with the pH of the original solutions. In all cases the pH values for the diluted samples were larger (less acid) than the pH of the original solution and the difference between these values gave the increase in pH due to dilution alone. (Table 2, Columns 4 and 5.)

Solution 14 which is buffered with sodium citrate required 10.3 c.c. of acid to neutralize a 25 c.c. sample. Where the dilution is so great, amounting to 31%, the increase in pH was 0.19. Correction was made for this large variation only. All other solutions gave variations caused by dilution which deviated from the average by not over 0.06 pH. This was neglected as it is of the same

TABLE 2
Detailed Analysis of Results in Table Number 1

	1	2	3	4	5	6
Series	Solution No.	Original pH E	Alkalinity c.c. NH ₄ OH per gallon	Per Cent dilution in Neutralization	Increase of pH from dilution	Final pH Neutral to Methyl Red E
A	1	5.44	2.47	11	0.08	3.84
	7	5.44	0.71	4	0.0	3.49
	9	5.43	1.77	8	0.02	3.96
	10	5.46	3.15	14	0.07	4.20
	11	5.41	1.94	9	0.03	3.80
	12	5.47	2.12	10	0.06	3.60
	14	5.48	7.95	31	0.19	4.10 ²
	16	5.41	2.19	10	0.05	3.52
		Av. 5.44				Av. 3.81
	Max. Dev. from Av.	0.04			Max. Dev. from Av.	0.39
B	4	5.59	1.01	5.5	0.03	3.45
	5	5.61	1.06	5	0.02	3.65
	6	5.61	1.18	6	0.06	3.60
	15	5.57	3.1	14	0.07	3.80
	17	5.64	3.65	16	0.07	3.67
	18	5.66	3.65	16	0.07	3.82
		Av. 5.61				Av. 3.67
	Max. Dev. from Av.	0.04			Max. Dev. from Av.	0.35
C	3	5.26	3.98	17	0.09	3.24
	13	5.34	2.80	12.5	0.05	3.67
	17	5.64	3.65	16	0.07	3.67
		Av. 5.41				Av. 3.52
	Max. Dev. from Av.	0.23			Max. Dev. from Av.	0.28
D	2	5.75	2.24	10.5	0.05	4.17
	8	5.70	-2.14 ¹	8	0.00	6.05
	18	5.66	3.65	16	0.07	3.82
		Av. 5.70				Av. 4.68
	Max. Dev. from Av.	0.05			Max. Dev. from Av.	1.37

¹c.c. NH₄OH acidity to Methyl Orange.

²Corrected for dilution.

order of magnitude as the limit of accuracy of a quinhydrone determination which is slightly better than 0.05 pH.

In the titration of the nickel solutions or in the measurement of the standard acid an experimental error of two drops corresponding to 0.1 c.c. is greater than one would ordinarily allow; yet in solution No. 9, which is not strongly buffered, a difference of two drops in the amount of acid added only produced a change of 0.04 pH.

It is recognized that in titrating two nickel solutions of different composition with methyl red, the pH of the resulting solutions when giving the same color will vary by an amount equal to the difference in salt errors of the indicator. It has been shown^a that the average salt error for alcoholic methyl red with the nickel solutions being and the maximum deviation from this average amounted to only 0.09 pH. Where the sample of nickel solution is diluted with water before titrating as in the Sizelove method the difference in salt errors of the indicator may be larger although one would hardly expect differences of a magnitude shown in Table No. 1, due to this cause alone. It should also be stated that it is impossible to titrate the undiluted nickel sample directly without the same uncertainty in determining the end point which one experiences with Thomson's method.

A combination of all of the above errors in the same direction, that is all errors being either positive or negative, would be expected to produce a variation of about 0.3 pH between the true pH for the color change of methyl red and the value obtained in the titration. A more detailed analysis of the results (Table 2) shows that this is probably true. In Series "A" the final pH when neutral to methyl red showed a maximum deviation of 0.39 pH from an average value of 3.81. In Series "B" the maximum deviation is 0.35 pH after making neutral to methyl red, and Series "C" shows a maximum deviation of 0.28 pH for the solution when neutral to methyl red.

In Series "D" the pH values of the original solutions varied only 0.05 pH from the average. After neutralizing the maximum deviation was 1.37 pH. This unusual value is due to the fluoride solution No. 8 which required alkali to make it neutral to methyl red and must be regarded as an exception. The other two solutions would have shown an average pH value of 4.00 and a maximum deviation of 0.18 pH.

In conclusion one may state that differences in buffer characteristics of nickel solutions and the experimental error in the titration method makes it impossible to adjust solutions of different compositions to the same pH value by means of any titration alone.

It must be pointed out, however, that the errors which led to the variations recorded in this paper: approximately
0.05 pH due to quinhydrone measurement,
0.06 pH due to dilution in adding acid,
0.09 pH due to salt error of indicator, and
0.04 pH due to measuring acid,

do not interfere with the use of the titration method in the control of a single solution of constant composition. In this case the 0.05 pH variation in the quinhydrone measurement and a probable difference of less than 0.05 pH in the titration of the sample with acid are the only errors that would affect the results, as the others would either not exist or would be the same at all times. It should be possible, therefore, to control the acidity of a single solution of definite composition within about 0.10 pH by determining what alkalinity to methyl red, as c.c. of commercial ammonia per gallon corresponds to the desired pH value.

The values of alkalinity of the solutions recorded in

^aBlum and Bekkedahl, Advance paper, Am. Electrochem. Soc., Sept., (1929).

Table 2, Column 3, may be used to control the acidity of the respective solutions at their original pH values. If other operating values of pH are found more satisfactory, the solutions would have to first be adjusted to the proper pH by empirical additions of acid or alkali and then titrated with acid and methyl red to determine the corresponding value of alkalinity in terms of c.c. of commercial ammonia per gallon of solution. After once establishing this value the solution could then be maintained at this value of alkalinity by the titration method.

It was found in one plant doing nickel plating on a large scale with a great variety of work that a still solution, run cold, containing

3 oz. per gal. of Nickel
2 oz. per gal. of Ammonium Chloride and
2 oz. per gal. of Boric Acid

would operate best at an alkalinity of 3.5 c.c. of ammonia per gallon. In barrel plating a solution of the same composition gave the best results at an alkalinity of 6 c.c. of ammonia per gallon. If the alkalinity was allowed to drop to 2 c.c. of ammonia per gallon, the work so plated would peel upon ball burnishing.

An alkalinity of 6 c.c. of ammonia per gallon also gave the best results with a hot nickel solution containing 32 oz. per gal. of single salts, 2 oz. per gal. of nickel chloride and 4 oz. per gal. of boric acid.

While the above values are only relative and cannot be applied directly to solutions of other compositions, the fact that this method has been successfully used in practice would in itself prove that the possible variations in pH of the solutions so controlled must have been within the allowable limits for satisfactory operation. The method, therefore, is worthy of more attention than it has received, as it affords a ready means of determining the quantity of commercial acid or alkali required to adjust the acidity at the same time that its value is being determined.

Green Smut Solution

Q.—I am having some trouble with my smut green solution (on brass). I am using carbonate of lead and antimony to get the smut; when I rub off the high spots on the article I am coloring, it looks white, not green.

A.—Your trouble is due either to the use of the lead and antimony, or to using more than the amount needed. Both lead and antimony deposit with a grayish color along with the gold. This, combined with the silver necessary to get the green shade, gives too large a proportion of white metals.

If the deposit required is a good green in the background, the green gold solution will give this result without additional agents. If, however, antique greens are desired with a distinct green color on the highlights, small amounts of white arsenic dissolved in caustic soda and added to the solution will be found preferable.

—WALTER FRaine.

Cobalt Plating

Q.—We are particularly interested in cobalt plating. Could you give us a list of the main booklets that have been issued during the past ten years on this subject and also any special articles? We are thoroughly acquainted with Book No. 334 issued by the Ottawa Government Printing Bureau in 1915.

A.—We regret to advise you that we know of no other work than that of the Ottawa Government Printing Bureau on the subject of cobalt plating that has appeared since 1915. The Ottawa publications are believed to be quite complete.

—A. K. GRAHAM.

The Present Situation as Regards Chromium Plating

The Need for Further Research— The Electroplaters' Fund Is Vital

By W. W. McCORD

McCord Radiator and Manufacturing Company, Detroit, Mich.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

WITH so much written and published on the subject of chromium plating in the past five years, it might seem that anything to be said now would be purely repetition, but the writer feels that the most cogent facts in respect to it, are either being entirely neglected or glossed over, and that the time has come for a little plain speaking.

Chromium Plate Not Wholly Successful

Chromium plating as yet has not proved an unqualified success. There is a very widespread dissatisfaction with it, particularly on the part of the ultimate consumer, and we propose to analyze this a little, see how much justification there is for it, and suggest remedy, if any.

To trace back, do not forget that there was also very general dissatisfaction with nickel, prior to chromium. The difference was that the public accepted it without much grumbling on the basis that it was the best it could secure, and that if that type of finish was desired, that the disadvantages came with it. Men and women alike enlarged their biceps polishing nickeled parts and even then could not keep them looking right. When they finally succeeded in rubbing off all the nickel, and the part began to corrode, they paid for replating without very much outspoken kicking.

But the very speed with which chromium plating was embraced, once it was at all known, proves that the underlying resentment against nickel was present, although not expressed. This very speed contributed to the present feeling against chromium.

As soon as it became known that chromium plating was really a commercial possibility, the gold rush was on. Some manufacturers were forced to start chromium plating practically over-night, when they hardly at that time knew whether chromium was a metal or a fish. There was already a reasonable amount of information available, provided the individual knew where to obtain it but many did not, and in addition there was plenty of misinformation current. The mechanics of the plating which has since been so elaborately worked out was, at the best, rather imperfectly understood. The miracle is that the first general plating to come on the market was as good as it was but there is no disguising the fact that it was not very good. Throwing power was an awful bugbear, and, the percentage of only partially covered material was altogether too large, to say nothing of its quality, even if it were covered.

It was generally understood that a coating of chromium over a given undercoating of other metals, tremendously increased the life of the whole. As it cost additional money to put on this extra coat, and as no one likes to increase sales price, there was a tendency to cut down the thickness of the undercoating to partially compensate for the cost of the additional coat. As the equipment was very costly to put on the chromium coating, the inclination was to get much as possible out of the investment, by cut-

ting the time in the chromium to the minimum that would give the color and tarnish prevention, without regard to the length of life of the whole plate.

At the same time, as this was going on, the possibilities of chromium inflamed the imaginations of advertising departments. It was obviously such an improvement over nickel that it gave them plenty about which to rave. And they did! It did not need any polishing or attention! It did not tarnish or corrode! It lasted indefinitely! It was so hard that it could not be scratched!

There was a basis of truth to everything they said, and there was no intention to deceive, but they were not sufficiently informed as to the real facts in actual practice. The public drank it up, and gained an impression of chromium plating that surpassed what any one impassioned advertiser could achieve.

Reaction From Over-Praise

Then came the reaction. The public discovered that the ornamental finishes generally were very easy to scratch and they could not reconcile that with its supposed hardness. They found yellow spots where nickel was exposed. Finishes showed stains from various causes, and through lack of proper information on the care of chromium, often they went to the entirely unnecessary exertion of actually polishing as they had previously done with nickel. The plate chipped off parts subject to bad torques. But worst of all, they found to their horror that much of what they were actually buying lasted no longer than nickel, before corrosion set in. The public finally reached the conclusion that someone had been bunking them, and began kicking strenuously when anything did not measure up to their own mental standard.

Those who know the facts about chromium will deny that there was a single untrue statement made, and that under certain conditions any of the statements can be substantiated, but we must not lose sight of the fact that the public knows nothing of the conditions and never will. All they know is their own experience with it, and that does not check with their impressions.

The writer believes there is a good deal of justification in their position. They were led to believe entirely too much. That is not their fault. Necessarily chromium plating had to go through a stage, which was very close to experimental, in its transition from laboratory to production, and it is not surprising that during that period much work should fall into the hands of the public that was not up to a fair grade, but it is extremely unfortunate that they did not receive this until after they had already formed their exalted ideas.

Inferior Work Still Being Turned Out

The part that cannot be excused is that now after several years of widespread use, much of what the public is receiving is still of very inferior grade.

There is plenty of information available to enable a

manufacturer or plater to do a good job on the actual mechanics of the plating. Corporations with engineering services for sale, the laboratories of Cornell, Columbia, Michigan, Wisconsin, Pennsylvania, and many other universities, research engineers in many industries, the Bureau of Standards, platers and plating engineers, the American Electroplaters Society, the American Electrochemical Society, and many other societies, trade papers, supply houses, and a host of others, have all contributed to the gathering and dissemination of a vast total of vital information on the actual business of putting on a chrome plate. Not everything in respect to it is known by any means, but a good deal is, and any man who wants to learn how to do it, can easily secure enough information to enable him to do the actual plating with at least a fair degree of success. There is no longer any excuse for bad plating in the sense of imperfect coverage, or anything of that character, falling into the hands of the public.

The confidence of the public must be regained. This is vital to the manufacturers selling plated articles, to the platers, to the supply houses, and last, but not least, to the public, themselves, because in the last analysis, if they persist in their attitude of kicking about chromium, they will end up by finding they have bit off their noses to spite their faces.

Chromium is capable of being a finish, in a vast number of applications, far superior to nickel. There is no justification in using chromium, unless what the consumer receives is actually better than nickel. How much better it should be, altogether depends upon the usage and application. There is no sense in putting a plate on automobile parts that would be shining brightly years after the car was rusting away in a scrap yard, but neither should the car owner be forced to replating all the parts on his car six months after he buys it.

Plating Specifications

Engineers should specify a thickness and character of total plate that would give adequate protection for the character of service intended, and platers should see that the plate which they apply is on the safe side of that specification. The public will gradually find that their attitude is unfounded, and everybody will live happily ever after.

But when we look for the data on which to base any specification, we are astonished to encounter an almost complete vacuum. Of course, individual concerns have done a certain amount of work along observation lines of the length of time that the particular plate which they are using on their product will stand up under the conditions to which it is subjected, but at best it is pretty fragmentary information and there has been no real effort to make comprehensive tests and correlate results.

In other words, when a manufacturer wants to write a specification for a plate on a certain article of a given base metal, and desires to be sure that this will last without corrosion of any kind for a given length of time, there is really no authoritative information available, to which he can turn, which will tell him that an undercoating of such and such metals, of given thicknesses, put on in given manners, and topped with chrome of given thickness can be expected to last the time which he requires.

Until this information is available and specifications are drawn that really mean something, we may expect the present rather chaotic state of affairs to continue to exist with chromium plating meaning most anything. We must not lose sight of the fact that the public is in no position to differentiate between plates. With the individual consumer, it is all chrome plate as far as he is concerned, and

his opinion of chrome plate depends entirely upon his own personal experience with that which he encounters. In other words, every failure on the part of anyone's plate tends to hurt everyone that sells chrome, no matter what the application. No one that manufactures or sells chrome can segregate themselves with any false sense of security, in the belief that what they are selling is all right, so why worry about the other fellow.

Chrome plate is either going to be a monumental success or it is going to be a monumental failure, and no one concern, or hundred concerns for that matter, is going to be able to withstand the tide, in either case.

In order to insure success, everyone's plate must be right, and in order to accomplish that end, definite, authoritative information must first be available, and then must be used.

Research Should Be Continued

There is a definite movement on foot to procure and make it available. The Bureau of Standards has been a large contributor to the fund of information now available to manufacturers and platers regarding the actual mechanics of chromium plating, i.e., make-up of solutions, behavior of bath, anodes, racks, ventilation, and all the other problems incident to the production of a plate.

Along with them, and working under the supervision of Dr. Blum of the Bureau, have been research men paid from funds contributed by a large group of manufacturers and platers, and their results on specific problems have been decidedly worth while to everyone interested in chromium.

This fund was subscribed annually for a three year period which is now nearly at an end.

It is proposed that the fund be again renewed for another three year period, and that the work, instead of being along the lines of investigation of the actual plating itself, now be turned to a comprehensive study of the corrosion resistance of various types of plates of varying thicknesses on all usual base metals, with the idea of making available data to be used in specifications by anyone desirous of using them.

Negotiations are under way, which will probably be consummated, so that the outdoor exposure tests will be run at the locations, and in conjunction with the American Society for Testing Materials, so that the results may enable the latter to embody them in their information.

The government men at the Bureau will also work in conjunction with the special research men, hired for this specific purpose. In case the funds are subscribed as freely as it is desired and expected, it is possible that in addition to the work at the Bureau, fellowships at various universities will also be employed to aid the purpose.

The fund is collected and administered by a special research committee, appointed by the American Electroplaters Society, but is held entirely apart from any funds of that society, and used solely for the purpose named.

As the men composing that committee give freely of their own time and money in order to further the general good, and as the solicitation of funds is at best a hard and thankless task, it is hoped that everyone reading this article will appreciate that the aim for which we are striving is one of vital importance to everyone, so that when the appeal for funds is made, as it shortly will be, that they will do their best, not only to make the response generous, but prompt, so that the work of the committee will not be increased by the necessity of too much follow-up endeavor.

Conference Approves Simplification on Full Disc Buffs

A general conference of representatives of manufacturers, distributors and users of buffing wheels on October 7, 1929, approved a simplified practice recommendation in which the 4, 5, 6, 7, 8, 11, 13, 14, 17, 18 and 20 inch full disc buffing wheels were selected as standards for stock items. The action of this conference resulted in a reduction from 17 different diameters to 11 standard sizes as indicated above, corresponding to an elimination of 35 per cent of needless varieties. The conference also voted that 20 ply should be adopted as the standard ply for stock buffs, reports the Division of Simplified Practice, of the Bureau of Standards, Department of Commerce, Washington, D. C.

Standing Committee Appointed

The recommendation is to become effective January 2, 1930, for production on the new schedule, and January 2, 1931, for the elimination of current stocks of non-standard sizes. The appointment of a Standing Committee was authorized to consist of the following representatives: MANUFACTURERS OF BUFFS: B. H. Divine, president, Divine Brothers Company, Utica, N. Y.; Floyd T. Taylor, vice-president, Hanson-Van Winkle-Munning Com-

pany, Matawan, N. J.; E. Winthrop Hall, F. L. and J. C. Codman Company, Boston, Mass.

USERS OF BUFFS: One representative each from General Motors Corporation; Western Electric Company; Scovill Manufacturing Company.

DISTRIBUTERS OF BUFFS: Representative of Frederic B. Stevens Company, Detroit, Mich.

TEXTILE MANUFACTURERS: Representative of the Cotton Textile Institute.

MACHINERY BUILDERS: Representative of U. S. Electrical Tool Company, Philadelphia, Pa.

Standards Will Cut Down Waste

It was the combined opinion of the conferees that the adoption of the above diameters as standards would greatly reduce the wasteful cutting of sheeting out of which buffs are made and at the same time reduce the cost of production and distribution.

The Standing Committee is to give further attention to the possibilities for standardization of sewing, arbor holes, and pieced buffs. Also, it was the sense of the meeting that the Standing Committee give consideration to the standardization of polishing wheels.

Sludge in Cadmium Solution

Q.—I am operating a cadmium solution and have trouble with sludge dropping to the bottom of the tank. How can this sludge be removed in the best manner? Also, how can a cadmium solution be cleaned in general? Has anything been published on this particular subject?

A.—While there is a certain amount of sludge or sediment in nearly all cadmium plating solutions, it has caused no great trouble as far as we know. We would suggest that the solution be filtered through a felt filtering bag. To prevent the formation of this sludge in the future, place the anodes in muslin bags.

It might be well to have a sample of this solution with some of the sludge sent for an analysis, as the formation of this sludge, if very great, may be due to some constituent of the solution being out of proportion.

—OLIVER J. SIZELOVE.

Gold Recovery from Solution

Q.—My firm intended to do gold plating; they gave me a five ounce ribbon of gold. After I had the gold cut down and added the ammonia and started to wash it, they told me not to make the solution as they had changed their mind about doing gold plating. Now they ask me if I can bring the gold back to lump form as they want to use the gold for something else. I would appreciate it if you would tell me how to bring it back to lump again.

A.—Probably the least expensive method for you to follow would be to wash the ammoniuret of gold free from ammonia. Place it on filter paper, dry thoroughly and send to a reliable refiner to be remelted. The cost is low.

Should you prefer to try to recover the gold yourself, proceed as follows: Wash free of ammonia; evaporate to dryness over a water bath. The residue may then be crushed in a mortar. Mix with equal weight of litharge (lead oxide) and a thirtieth part of its weight of char-

coal powder. Put in fire clay crucible and heat to bright redness in a small furnace. This will give a gold-lead button. Boil this button in nitric acid to dissolve the lead. The gold is left in a finely divided state and after washing may be fused into a homogenous mass ready for rolling into strip.

—WALTER FRANE.

Smut Gold Deposits

Q.—Can you give me any information as to what may be added to a green or yellow rose gold solution that would act as a hardener to that solution? In a green rose smut solution what agent would keep the smut or deposit from coming out so easily? I have reference to finishes on rings and pins.

A.—The smut deposit preparatory for rose gold, either copper or silver, is generally soft because it is more rapidly secured by using a solution rich in metal but with a low free cyanide content to get the best conditions for relieving the high lights. If the solution is high in free cyanide, the smut has a rougher or sandy effect, pulling out of the background more freely and being harder to relieve.

To get the finest colors in rose gilding only pure gold should be used for the anodes. Nickel may be alloyed with gold in the proportion of 2 or 3 nickel to 21 or 22 parts of gold, for ordinary gold plating, to secure a better wearing deposit, but the colors are not so warm and rich. If color is not the prime requisite, this may serve your purpose. A solution of this character would have to be made by using a porous cup to run in the metal.

We know of no other satisfactory method of hardening the deposit. Bicarbonate of soda or whiting will relieve the high lights without dragging the smut out of the background if the operator is skilled.

—WALTER FRANE.

Lime Process for Coating Aluminum

Aluminum May Be Given a Pleasing
Dead-White Finish, by Boiling It in a
Mixture of Lime and Calcium Sulfate

By LEON McCULLOCH

Research Department, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

A PAPER PRESENTED AT THE MEETING OF THE AMERICAN ELECTROCHEMICAL SOCIETY, HELD AT PITTSBURGH, PA., SEPTEMBER, 1929

A DEAD-WHITE coating can be given articles of aluminum by boiling them in "milk of lime," with the addition of a little calcium sulphate. No electric current is needed. Ten grams of unslaked lime and ten grams of calcium sulfate are used for each liter of water. Plaster of Paris may be used, but the fully hydrated sulfate is preferred, since there is less caking at the bottom of the tank. Each day a fresh addition of lime and calcium sulfate should be made, as it is suspected that the bath deteriorates in some way on ageing. The temperature should be kept at about the boiling point, although good coatings have been obtained at 85° C. The bath should be gently stirred to prevent settling, and the metal pieces so suspended that sediment will not accumulate upon them. The time of the process may be varied somewhat, although after a time there is no appreciable increase in the thickness of the coating. A foil of pure aluminum increased in thickness according to the following figures:

Time Min.	Thickness	
	Mm.	Inch
0	0.025	0.001
15	0.043	0.0017
30	0.045	0.0018
60	0.050	0.0020
240	0.060	0.0024

A chemical analysis of the coating upon a foil showed this composition:

	Per Cent
Aluminum oxide	54.5
Calcium oxide	5.75
Sulfur trioxide	10.7
Water, expelled at 300° C.	29.0
	99.95

Re-arranging these figures, we get:

	Per Cent
Aluminum oxide	53.7
Calcium sulfate	14.0
Aluminum sulfate	3.3
Water	29.0
	100.0

The coating is seen to be a hydrated mixture. For some applications the combined water may not be objectionable; for others, the water may be expelled by baking at about 300° C. In the coating process hydrogen is given off while the metal is being attacked by the alkaline solution. Aluminum oxide makes up the most of the coating, and calcium sulphate seems to be present, but the persistent alkalinity of these coatings indicates

calcium aluminate also. The action of calcium sulphate in the bath is not known, except that it makes the coatings smooth, fine-grained and adherent. Without it, the metal is corroded unevenly and pitted, and the deposits are loose and rough. Perhaps the sulfate aids by dissolving the oxide film, which makes aluminum passive. The chemical analysis indicates the formation of a small amount of aluminum sulfate. Other calcium salts, the nitrate for example, also give smooth deposits. Calcium sulfate was selected partly on account of its low solubility, that it might have a buffer action on the calcium content.

Coatings may be produced also with strontium hydroxide, by the addition of a salt of strontium. These coatings are coarse and granular, though some of them are very adherent. Barium hydroxide with barium salts produces no films, and causes rapid corrosion of aluminum.

The color of the lime coatings upon pure aluminum is a dead-white; upon alloys of aluminum it is various shades of gray. There is no action upon magnesium, since this metal is not attacked by alkalis. The film formed upon zinc is extremely thin.

The lime coatings upon aluminum are extremely fine-grained, very adherent, and do not separate from the metal on bending. They cannot be rubbed off with the fingers; rubbing with "art gum" does not remove them; they may, however, be removed by a rubber pencil eraser.

These coatings are not so thick, nor are they so hard as those formed by electrolytic methods,¹ but their dead-white color gives them a better appearance. They may on this account have various uses. After being sized, to prevent the spreading of ink, they may be written and printed upon. Sheet aluminum coated in this way may be well suited for instrument scales and dials. These coatings might also be colored or enameled to obtain decorative effects.

These coatings probably cannot be recommended to be especially resistant to corrosion. In a salt spray test they did not look as good as certain coatings made by electrolysis, using chromic acid. They might, however, on account of their porous structure and their good adherence, make an excellent foundation upon which to apply paints or enamels to aluminum.

The lime process may have a field of its own, on account of its cheapness and simplicity. Since electrical connections are not needed, difficult work may be handled, such as very fine wires, thin foil, and articles of intricate shape.

¹C. E. Skinner and L. W. Chubb, Trans. Am. Electrochem. Soc., 26, 137-47 (1914). G. D. Bengough and J. M. Stuart, "The Anodic Oxidation of Aluminum as a Protection Against Corrosion," Department of Scientific and Industrial Research, London. Published by H. M. Stationery Office (1926).

Size of Cast Bar	Finished Size Gauge No. B. & S.	.180	.162	.128	.102	.081	.064	.051	.040	.032	.025	.020	.016	.0126	.010	.006
4" x 1 1/8"	Length of Sheet.....	31.5	35.1	44.3	55.7	70.2	88.7	111.4	142.0	177.0	227.9	284.0	355.0	450.5	568.0	710.0
	Length of Travel.....	35.1	39.4	49.4	61.4	77.0	97.4	122.0	154.0	191.0	240.0	299.0	374.0	470.0	590.0	735.0
4 3/4" x 1 1/8"	Length of Sheet.....	29.3	32.7	41.2	51.9	65.2	82.5	103.8	132.0	165.0	211.0	264.0	333.5	419.5	529.0	661.0
	Length of Travel.....	32.7	37.0	46.5	58.0	73.0	92.0	114.0	144.0	180.0	228.0	284.0	359.0	454.0	574.0	716.0
4 1/2" x 1 1/8"	Length of Sheet.....	20.3	22.6	28.6	35.9	45.2	57.2	71.9	91.6	114.5	146.5	183.0	228.5	291.0	367.0	458.0
	Length of Travel.....	22.6	25.9	32.9	41.2	51.2	64.0	79.5	100.0	124.0	156.0	194.0	243.0	304.0	380.0	474.0
5" x 1 1/8"	Length of Sheet.....	19.8	21.9	27.8	34.8	43.9	55.6	69.9	88.9	111.0	142.5	177.8	222.0	282.0	356.0	444.0
	Length of Travel.....	21.9	25.2	32.2	40.0	49.9	62.0	77.0	97.0	120.0	152.0	189.0	237.0	297.0	372.0	464.0
6 1/4" x 1 1/8"	Length of Sheet.....	22.6	25.1	31.7	39.9	50.2	63.5	79.7	101.4	127.0	162.5	203.5	254.0	322.5	406.0	508.0
	Length of Travel.....	25.1	28.4	35.4	44.0	54.9	68.0	84.0	106.0	132.0	167.0	210.0	263.0	333.0	418.0	522.0
6 1/2" x 1 1/8"	Length of Sheet.....	21.1	23.4	29.6	37.1	46.9	59.3	74.4	94.9	118.4	151.5	189.7	237.0	301.0	379.0	473.0
	Length of Travel.....	23.4	26.7	33.7	42.0	52.0	64.0	79.0	101.0	127.0	162.0	203.0	254.0	322.0	406.0	508.0
7" x 1 1/8"	Length of Sheet.....	19.8	21.9	27.8	34.8	44.0	55.6	69.9	88.9	111.0	142.5	177.8	222.0	282.0	356.0	444.0
	Length of Travel.....	21.9	25.2	32.2	40.0	49.9	62.0	77.0	97.0	120.0	152.0	189.0	237.0	297.0	372.0	464.0
8" x 1 1/8"	Length of Sheet.....	17.9	19.9	25.3	31.6	39.8	50.4	63.2	80.5	100.8	129.3	161.0	201.6	256.0	322.0	403.0
	Length of Travel.....	19.9	23.2	29.6	37.0	46.5	58.0	73.0	92.0	114.0	146.0	183.0	228.5	291.0	367.0	458.0
9" x 1 1/8"	Length of Sheet.....	16.4	18.3	23.2	29.0	36.5	46.2	57.1	73.9	92.5	118.2	148.0	184.7	234.5	296.0	370.0
	Length of Travel.....	18.3	21.6	28.0	35.0	44.0	55.0	68.0	86.0	108.0	138.0	173.0	219.0	279.0	350.0	434.0
10" x 1 1/8"	Length of Sheet.....	14.6	16.2	20.5	25.8	32.4	41.0	51.6	65.6	82.0	105.0	131.3	164.0	208.5	262.5	328.0
	Length of Travel.....	16.2	19.5	25.9	33.0	41.0	51.0	63.0	80.0	102.0	130.0	162.0	206.0	260.0	324.0	400.0
11 1/4" x 1 1/8"	Length of Sheet.....	12.6	14.0	17.7	22.2	28.0	35.4	44.3	56.5	70.7	90.5	113.0	141.5	180.0	226.0	283.0
	Length of Travel.....	14.0	17.3	23.7	29.8	37.0	46.0	57.0	72.0	90.0	114.0	144.0	182.0	230.0	288.0	358.0

Fig. 2—Chart which rapidly shows number of feet of metal that travels through the rolls.

knowledge of costs or of the relative profitableness of various mixtures and thicknesses of metal. We found also to our great surprise that we had no sales problem, which we had supposed was our greatest problem. And last, but not least, we were able to effect a number of very important changes in our personnel for the simple reason that the analysis of costs and the productiveness of each individual which was available at the end of definite periods showed plainly and unequivocally exactly what every man, machine, department and the organization as a whole was doing.

"An entirely new policy was immediately adopted. The old expensive sales organization was eliminated and the sales policy modified. Important changes were made in the supervision of plant operations so as to correct the inefficiencies discovered. Changes were made in processing which our now exact information showed to be desirable and certain operations were either changed or discontinued because we found that they could be dispensed with. Certain unprofitable products were also discontinued.

"The beneficial effects of these and many minor changes were immediately apparent and a constant improvement in earnings as well as in the financial situation has

steadily continued. Unit cost of labor was reduced in 1927 34.76% after paying bonuses to productive labor equivalent to an extra month's pay and without any elaborate sales organization. The tonnage sold in 1927 was 98.87% of the tonnage sold in 1926. From published reports the 1927 sales of America's largest producers of sheet brass and other brass and copper products were 89.42% of their sales in 1926. From this it will be noted that our sales did not suffer in spite of the fact that our former expensive sales organization had been reduced to a mere skeleton of what it was.

"The accounting procedure has been simplified to the extent that a trial balance is obtained on the sixth working day of the month, control statements are available on the fourth working day of the month and the controls on the seventh day. The entire procedure requires no extra office help and all employees of the Company except the officers are receiving bonuses.

"Every influence affecting production, sales and finance is reflected in the controls, the causes are indicated and the remedies are suggested, thereby removing all causes for alibis by departmental executives and enabling the Management to assume full responsibility for the direction of policy."

English and Gun Metal Finishes

Q.—We are sending you an umbrella runner with, as we call it, English Finish. Please advise if you can furnish us with the formula for English Finish on steel and brass, and Gun Metal Finish on steel.

A.—On the sample submitted the finish can be produced in the following solution:

Causticised soda 2 oz.
Sodium cyanide 2 oz.
White arsenic 1 oz.
Water 1 gal.

Dissolve soda and cyanide in hot water, add the arsenic, stir until dissolved. Use cold. Either steel or bronze anodes can be used. Current tension, 1 volt. Lacquer the work for protection.

Gun Metal Finish (blue) on sand blasted or other-

wise dull finished brass can readily be produced in the above solution.

A good Gun Metal Finish on steel can be produced as follows:

Make a saturated solution of sal ammoniac; use steel anodes. Hang a porous cup on the cathode rod filled to solution level with same solution. Place in cup as large a piece of steel as possible and connect to cathode rod. Electrolyze solution until a deposit can be secured on another strip of steel connected with cathode rod and hung in solution proper. The solution is now ready for plating. Hang in work until it gets a light blue color, rinse in cold water and dry. Dip work in linseed oil and bake at low heat. Give a final coat of paraffine for preservation.

—WALTER FRATINE.

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1929 by The Metal Industry Publishing Company, Entered February 10, 1903,
at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, \$2.00 Per Year. SINGLE COPIES, 20 CENTS. Please remit by check or money order;
Cash should be Registered. Advertising Rates on Application. Forms Close the First of the Month.

PALMER H. LANGDON.....Editor and Publisher
ADOLPH BREGMAN.....Managing Editor

THOMAS A. TRUMBOUR.....Business Manager
EVAN J. ROBINSON.....Advertising Manager

Address all correspondence to The Metal Industry, 99 John St., New York. Telephone, Beekman 0404. Cable Address Metalustry.

Vol. 27

New York, November, 1929

No. 11

Contents

Metal Working in an Aeroplane Factory.. 505	The Present Situation as Regards Chromium Plating 521
A Description of the Fabricating Departments of the Boeing Companies.	The Need for Further Research—The Electroplaters' Food Is Vital
By R. E. JOHNSON	By W. W. McCORD
Alloys to Resemble Gold and Silver..... 507	Conference Approves Simplification on Full Disc Buffs 523
By W. J. REARDON	Sludge in Cadmium Solution 523
Welding Monel Metal Castings 508	By O. J. SIZELOVE
By P. W. BLAIR	Gold Recovery from Solution..... 523
Smelting Lead Battery Plates 508	By W. FRAINE
By W. J. REARDON	Snut Gold Deposits 523
Sulphur Glaze on Bronze Molds 508	By W. FRAINE
By W. J. REARDON	Lime Process for Coating Aluminum 524
Blast Furnace Tuyres 508	Aluminum May Be Given a Pleasing Dead-White Finish by Boiling in a Mixture of Lime and Calcium Sulphate.
By W. J. REARDON	By LEON McCULLOCH
White Metals, Brasses and Bronzes 509	What Adequate Administrative Control Did for Us 525
A Series of Articles Describing the Types, Constituents, Properties and Methods of Making a Wide Variety of Mixtures as Practiced in a Large Casting Plant.—Part 2.	By George D. Stearns, President of the Bridgeport Rolling Mills, Inc., as Told to Francis A. Westbrook.
By E. PERRY	English and Gun Metal Finishes 526
Non-Ferrous Alloys Help Make the World's Fastest Ship 511	By WALTER FRAINE
The Possible Use of Beryllium in Aircraft Construction 512	Editorials 528
A Metal with an Interesting Future.	Prosperity Through Waste
By H. W. GILLETT	Continue Electroplating Research
Utilization of Secondary Metals in the Red Brass Foundry 513	Edison Used Brass
The Value of Scrap Metals in the Foundry. Operations Involved in Their Use.	Correction
By H. M. ST. JOHN	Shop Problems 530
Melting Nickel-Chromium Alloy 515	Patents 532
By W. J. REARDON	Equipment 533
Chilled Bronze Gear Castings 515	Variable Speed Buffer and Polisher
By W. J. REARDON	New Process of Spraying Tin
A Brass Foundryman's Progress 516	Cast Grid Tank Rheostats
How a Boy Grew Up to Be a Brass Foundryman. His adventures, Joys and Sorrows.—Part 2.	Aluminum Solder and Aluminum
By OTTO GERLINE.	Cut-Off Saw for Brass and Bronze
Turpentine Stains 517	Two-Motor Buffer and Polisher
By O. J. SIZELOVE	Heavy Duty Electric Grinders
Control of the Acidity of Nickel Solutions. 518	New Electric Acid Pump
How to Determine the Additions to a Solution of Definite Composition in Order to Control the Acidity Within Approximately 0.10 pH.	Automatic Double Disc Grinder
By DR. A. K. GRAHAM	Associations and Societies 536
Green Smut Solution 520	Personals 540
By WALTER FRAINE	Obituaries 540
	News of the Industry 541
	Review of the Wrought Metal Business.... 547
	Metal Market Review 547
	Metal Prices 548
	Supply Prices 550

THE METAL INDUSTRY is regularly indexed in The Industrial Arts Index

Edition this Month, 6,500 Copies. Buyers Guide, Advertising Page 99

Editorial

Prosperity Through Waste

FOR a number of years, now, we have been familiar with the slogan, "Eliminate Waste." Beginning with the great post-war depression, we have been told, again and again, that the road to prosperity is by the elimination of wasted effort, the reclamation of waste materials and prevention of waste in the form of useless expense. And we have taken this advice to heart. The past few years have shown a broad and deep improvement in methods of manufacture and economies in expenditures, and a consequent reduction in the costs of production have followed close behind. As a result we have had the astonishing spectacle of increased output and consumption of manufactured goods in the face of declining prices, a phenomenon never before experienced in our industrial history.

But another factor has been present which, while not absolutely new, has been effective in certain trades to an extent that we are just beginning to realize. We speak of the stimulation of demand by perhaps artificial means, such as tremendous advertising, installment payment plans, and last, but perhaps most important in its effect upon public purchasing, the acceptance of old or second-hand merchandise in part payment for new.

Consider for a moment the example of the man with a car four or five years old who has decided that he wants to buy a new one. His reason is legitimate; his car is worn out. Does he scrap his car, or sell it for junk as he would an old overcoat? No, he goes to the company where he contemplates buying a new car and gets from them a stiff allowance on his old car, which they will take in part payment on a new one. If he is a "shrewd" buyer, he may shop around to a number of automobile salesrooms to see who will give him the best allowance. In the end, in buying a car ranging from \$1,000 to \$2,000 in list price, he will get an allowance of from \$200 to \$600 for his old car, depending upon the condition of the old car and the price of the new one.

This is perhaps fair, although it lends itself to overpricing new cars and competing on the fictitious basis of the allowance for the old one. But other abuses have arisen, affecting not only this trade but industry in general. As a consequence of these high pressure sales methods, car owners are now being urged to buy a new car each year, or at least, every two years. Why not? The allowance on the "old" car is so much larger and the purchaser has so much pleasure out of a car which is new, better looking, snappy and up-to-date. And this method has carried over into other businesses like radio. It is being pushed much harder in the sale of pianos, and even comparatively low priced articles like phonographs. The same principle is used to sell typewriters and sewing machines. Where will it end? Does it mean that as a nation we have grown so wealthy that we must have only new things? Will "trade-ins" spread to furniture, clothing and jewelry?

The first effect of such stimulants noticeable on American industry was the prosperity and expansion of those

trades to which they were applied. Then came the fear of credit losses through the too rapid growth of installment sales. (We are all now familiar with the term "re-possessed car.") But the development of commercial paper banking has stabilized such credits to a fair extent. Now we are suddenly made aware of large accumulations of junk, heaped high and growing higher, in isolated parts of our cities. They are scrapped cars, to a great extent taken in trade by automobile dealers, in many cases with no thought of resale, but immediately dumped on the scrap pile.

Are these cars being reclaimed? Only to a small extent. The copper radiator has value, some brass, bronze and aluminum parts, easily removable, can be sold and reclaimed, but the bulk of the car, steel, iron, wood and upholstery, can be used only if it is near a foundry that can absorb highly miscellaneous scrap. It is dangerous to use a mixed collection of steels in the steel blast furnace, as the melt will be contaminated with several alloys. It is impossible to disassemble the car and sort out the various constituents profitably. Consequently, a great proportion of the costly parts of an automobile are irrevocably lost.

Another side light on American economics, this time in a widely different field. F. C. Munson, one of our great steamship owners, has deeply deplored the competitive building of large ocean liners, on the ground that they are unnecessary. The present lines are adequate to handle the traffic, and millions upon millions of dollars are wasted in duplicative effort. In this case, competition unrestrained is resulting in over-production which will eventually cost us dearly.

Where will this end? Are our scrap piles to grow indefinitely? Must the public continue to spend wastefully to keep our industries busy? We are prosperous. Is this prosperity fictitious? Must the public in general submit to savings-less or profitless prosperity, like some of our basic industries two years ago? Must we give up saving, and go spending without restraint in order to accumulate new things, scrapping the old ones to keep labor employed, and industry going at high speed? It would be a vicious circle indeed.

The effects are even more far-reaching. The public spends freely and plants are going at top speed; profits accumulate, money is plentiful, stocks rise wildly. But every link in the chain cannot hold indefinitely. Something must break first. We have just seen the stock market collapse. To some fearful souls this signifies the beginning of the end, and they now look for industry to slow down, one branch after another. To others it is only a warning but one of utmost significance. We must begin to take care.

There is no simple, short answer to our dilemma. We should not go on at such a fast pace. We should not continue to spend wastefully to bolster up the consumption of unnecessary products. But it is just as vital that we do not contract too sharply for the country will then be plunged into a depression. We have certain safe-

guards in the form of the Federal Reserve Board and a large group of very powerful banking combinations who are said to be using their resources to the utmost to prevent a fatal crash. **Inventories are not unduly inflated; credit is plentiful; industry is strong after several prosperous years. We are assured by President Hoover that the industry of the United States is basically sound and his opinion is re-echoed by Ford, Rockefeller and other business leaders.**

We are much wiser for our experience of 1921, but the past few years have made us relax a little. Too many have forgotten that prosperity is not limitless, and that trouble may always come to the careless. We must all have brought home to us in the directest possible fashion that prosperity can remain with us only through eternal vigilance, through a tight grip on our optimism, through unflinching courage and through the knowledge that true prosperity rests on buying freely the things we need within the limits of our income, when that need is real. By "things" we mean also those "luxuries" which are conducive to better mental and moral development. We need food, clothing and shelter for our physical well-being. Let us buy these as freely as possible. We need music, art, and literature for our mental and moral growth. Let us attend concerts and plays; let us buy phonographs and radios; let us buy books and pictures as we need them, and as we can afford them. And let us keep those things which we buy as long as they serve us well, discarding them when they are worn out, but not before, simply for the sake of buying something newer and more "modern." We need adequate transportation. Let us buy automobiles. We need outdoor recreation. Let us support athletic activities wisely, without waste and without niggardliness. We need science for our physical and mental growth. Let us support research, therefore, without stint, as we do education.

In this way will true prosperity be retained.

Continue Electroplating Research

RESearch is a word that is no longer a private or "highbrow" term. Research is now understood by everyone from the foundry apprentice to the president of the company. And in no industry is research more highly regarded than in electroplating.

Research is always something of a gamble. We must devote efforts to groping in the dark. We must spend money in driving tunnels through mountains in the hope that we will find the treasure of new facts or truths which will make our work clearer, less difficult, less costly and more valuable.

The electroplating industry is now confronted as never before with the need for research. Twenty years ago nobody cared about research because a plater was a plater and a plate was a plate, and that was all there was to it. Now we know that a plater should be a solution analyst and a plate should not only be bright, but it must be heavy, uniform, corrosion resistant and cheap. The public is awake to the beauty and utility of the fine electroplated finish and is making demands which the trade must satisfy.

Electroplating as an industry has grown apace and is still growing at a faster rate than ever before. It cannot continue without the firm foundation of new facts, improved methods and processes and improved results. How are these to be obtained? By guesswork? By

sporadic individual efforts here and there? By accidents and stumbling over new devices? We say that where such weak methods aid us, we are glad to accept their help. But we cannot build a great industry upon them. We must have solid, well laid plans in the hands of responsible, trained and intelligent leaders. The most important and the most promising of such plans at this time is the Research Fund of the American Electroplaters' Society, which is being administered by that Society in co-operation with the National Bureau of Standards.

In an article on page 521 of this issue, Mr. W. W. McCord pleads for the continuation of this Research Fund which was subscribed annually for a three-year period, and which is now nearly at an end. It is proposed that the Fund be renewed for another three years. New plans are afoot; co-operation is contemplated with the American Society for Testing Materials; the problem of the perfection of chromium plating is still before us. Other problems are legion which plating begs to have solved.

There are no two sides to this question. The Platers' Research program must go on.

Edison Used Brass

WHENEVER a great outstanding figure arises and the public becomes aware of him, it is only natural for everyone to search hard for some way of connecting himself with the great man. We plead guilty to this impulse, and can only say that we shall try to restrain ourselves from claiming too much.

Time after time in the daily press, descriptions of the celebration of the 50th Anniversary of Thomas A. Edison's invention of the electric lamp, we come across the words "brass" and "copper." Mr. Edison made his early models using these materials. He uses them in his manufactured products today. In the incandescent lamp, probably the greatest single contribution of the great man to the well-being of humanity, brass is a most important part. Humble? Yes. A hewer of wood and a drawer of water, perhaps, but absolutely indispensable.

We are reminded of an amusing story of Mr. Edison's early days. In order to do some experimental work and make some models, he had to buy brass. He was young and ambitious, but poor. He needed a fair quantity of brass, according to our recollection of the story, as it was told to us a number of years ago, perhaps \$100 or \$200 worth, but he could not pay for it in cash. The dealer, a shrewd and careful business man, looked him over, sized him up and decided that he was a good risk. So he extended him the credit.

Mr. Edison paid his bill shortly afterward, and continued to do business with this dealer. The moral is only that good men know each other on sight. Mr. Edison has grown to be one of the world's great men. The brass dealer, only a hewer of wood and a drawer of water, continued to exercise good judgment, conducted his business successfully and has since retired in comfort. We know that he takes as much pride in Mr. Edison's achievements as if they had been his own.

Correction

In the October issue, in an editorial entitled "Bus Bars Across the Sea," the statement, "It was a graceful act of the American Electroplaters' Society," etc., should have read " . . . American Electrochemical Society." The editor regrets this typographical error.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN, A. B. W. J. PETTIS
W. J. REARDON P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE
WILLIAM BLUM, Ph. D. A. K. GRAHAM, Ph. D.
G. B. HOGABOOM WALTER FRAINE

Brown Dip for Brass Plate

Q.—I would like information on producing a chocolate brown color on the brass plated surface of cast iron. A dip process is preferred. The articles are bases for floor lamps and the dip must be economical as the lamps are produced in large quantities.

A.—To produce a brown color on brass, one of the two following formulae can be used:

No. 1

Caustic soda 8 oz.
Antimony sulphide 2 oz.
Water 1 gallon

Use the above at boiling temperature; rinse articles and dip for a few seconds in a cold copper sulphate solution made by dissolving 4 oz. of copper sulphate in 1 gallon of water. Scratchbrush dry with a crimped brass wire wheel operated at 800 to 1,000 R.P.M.

No. 2

Copper sulphate 8 oz.
Nickel sulphate 2 oz.
Hyposulphite of soda 8 oz.
Water 1 gallon

Use at boiling temperature and immerse until smut appears. Scratchbrush dry.—O. J. S., Problem 3,902.

Cadmium-Copper Solution

Q.—In answering Problem 3852, you gave the analysis of a cadmium copper solution, which gives a silvery finish. We would greatly appreciate it if you would give us the formula for this solution, as your answer does not give the chemicals that are used in making it up.

Is it less expensive and no more trouble to use the regular cadmium solution in place of the cadmium-copper? What is the formula for a cadmium solution?

A.—A solution can be made of the following chemicals that will give an analysis similar to the one referred to in Problem 3852.

Copper cyanide $\frac{2}{3}$ oz.
Cadmium oxide $\frac{1}{4}$ oz.
Sodium cyanide 2 oz.
Water 1 gallon

The constituents of this solution for general use would be considered low, so if you decide to do some experimenting with this particular type of deposited alloy, we would suggest that you use the following formula:

Copper cyanide 3 oz.
Cadmium oxide $\frac{1}{2}$ oz.
Sodium cyanide 5 oz.
Water 1 gallon

Use 2 oz. of the sodium cyanide as given in the formula to dissolve the cadmium oxide and the other 3 oz. to put the copper cyanide in solution.

Use solution at a temperature of 100 deg. to 110 deg. F., with 10 to 15 amperes per square foot of cathode surface. Anodes should be of copper and cadmium in the ratio of anode surface of 4 of copper to 1 of cadmium.

It is considerably more expensive to produce a deposit of cad-

mium than one of equal thickness of copper, due to the more expensive cadmium salt. Formula for cadmium solution:

Cadmium oxide 3 oz.
Sodium cyanide 9 oz.
Caustic soda 2 oz.
Water 1 gallon

Use at 80 deg. to 90 deg. F.; 10 to 15 amperes per square foot.

—O. J. S., Problem 3,903.

Copper on Silvered Mirrors

Q.—We put silver on mirrors by the usual methods. Can you tell us how we can copper plate the silver?

A.—The copperplating is done as follows:

Dissolve 28 oz. of copper sulphate in $1\frac{1}{2}$ gallons of distilled water. In another vessel, dissolve $1\frac{1}{2}$ lb. rochelle salts in $1\frac{1}{2}$ gal. distilled water. Mix the two solutions and stir thoroughly. Add just enough ammonia to redissolve the precipitate. The solution is then ready to deposit copper upon the silvered glass reflector.

Use approximately 1 volt, with copper anodes.

—O. J. S., Problem 3,904.

Chromium on Cast Iron

Q.—I am in need of a good recipe for a chromium plating solution, and I would be very thankful if you would send me one. I am also in need of advice on how to handle cast iron to be plated with chromium.

A.—Formula for chromium solution:

Chromic acid 55 oz.
Sulphuric acid 0.33 oz. by weight
Water 1 gallon

Temperature, 95 deg. F. Anode current density, 15 amperes; cathode current density, 50 to 75. Distance between anode and cathode, 6 to 8 inches. Use 6 per cent antimony lead anodes.

The cast iron, after polishing operation, should be copper plated, colored, nickel plated, colored, and then chromium plated, to make a first class finish.—O. J. S., Problem 3,905.

Chromium on Zinc Die Casting

Q.—I am sending you a sample of a nickel solution which I would like to have analyzed.

I am having some trouble in producing a good chrome plate on zinc die castings. At present I nickel plate them then chrome plate, using a commercial electric cleaner to which I have added some cyanide. I then rinse in cyanide solution and finally in pure water. The nickel bath consists of single nickel salts ammonium chloride, boric acid, sodium sulphate, nickel chloride, cadmium. The product is apparently excellent, but when subjected to a 24-hour salt spray test the plate blisters. Examined under a magnifying glass, the nickel plate shows small pits, which we think are due to hydrogen gas. To remedy the blistering, I propose to install a hot cyanide copper solution for a triple plate; also, agitation in the nickel bath and the addition of some sodium perborate to remove the excess hydrogen and prevent the pitting. I also plan to use a weak (5%) muriatic rinse after the electric cleaner to eliminate the cyanide wash.

I would highly appreciate any suggestions you might have to

correct the blistering and enable us to get a chrome plate that will withstand a 24-hour salt spray test.

A.—Analysis of nickel solution:

Metallic nickel	3.26 oz.
Chlorides	3.02 oz.
pH	5.8

Analysis of nickel solution shows it to be in first class condition. A 24-hour salt spray test is quite severe for chromium plated die cast work.

We would not advise the use of a cyanide copper deposit over the die cast work before nickel plating. We would advise a heavier nickel deposit and the use of an acetic acid dip for the work before nickel plating. Would not advise the use of an agitator on the nickel tank nor the use of sodium perborate for die cast work.—O. J. S., Problem 3,906.

Depositing Metal on Glass

Q.—We are experimenting in plating non-metallic materials. At the present time we are trying to get a good metal deposit on etched glass, but find that upon polishing same or exposing it to high temperature our metal deposit parts from same.

We would appreciate it very much if you could give us information on this matter. This being a commercial proposition, we would like to use a material that does not require fusion.

A.—For depositing a metal upon glass without firing, the following method is usually employed:

The articles are freed from any oil or grease and then placed in a dilute solution of hydrofluoric acid to roughen the surface slightly, rinsed in clean cold water, and then they are ready for the silvering treatment, for which two solutions are necessary.

No. 1—Dissolve 90 grams of pure cane sugar in distilled water, add 4 c. c. of C. P. nitric acid and 175 c. c. of ethyl alcohol. Make up to 1 liter by adding distilled water.

No. 2—Dissolve 1.8 gm. of silver nitrate in distilled water and add ammonia, drop by drop, until the precipitate which forms is nearly redissolved, then add 0.9 gm. of potassium hydroxide dissolved in a little water and again nearly redissolve the precipitate by the addition of few drops of ammonia.

Take 1 part of No. 1 solution and 9 parts of No. 2 solution, mix thoroughly, and immediately immerse the article which has been prepared by dipping in the hydrofluoric acid. The surface will be covered with a deposit of metallic silver.

The deposit is quite adhesive and is a base for further deposits of silver or copper.—O. J. S., Problem 3,907.

Fluxing Brasses

Q.—We have been referred to you for information concerning the proper fluxing of brass and allied metals and alloys in the small foundry. Will you please let us have information bearing upon this, and general recommended foundry practice in producing brass and similar alloy castings?

A.—Flux may be divided into two kinds: Non-metallic substances such as borax, fluorspar, etc., which melt and form fluid slag upon the metal, which are the true fluxes; and metallic substances such as phosphor, silicon, copper, manganese, etc., used in small amounts for the purpose of reducing oxides which are present in the metal.

Plaster paris melts at a red heat and has the property of dissolving oxides and silica. It is, therefore, a good brass foundry flux. It is a neutral flux and attacks the crucible the least of any of the so-called fluxes. We suggest the following mixture for general foundry use of a non-metallic flux: one part each of plaster paris, soda ash, common salt, lime.

We also suggest the use of common salt alone. It is universally used in brass rolling mills for melting brass. It has the property of decomposing oxide of copper when melted. Common salt possesses the property of reducing oxide to metal and thus the action is one of purification. Add a handful to a crucible when the metal goes into the fire.

Borax is also a good flux and possesses the property of dissolving the metallic oxides. Common salt is the true flux for brass melting and should be used without discrimination. All copper alloys are improved by its use.

Among metallic fluxes we recommend 15 per cent phosphor copper. Addition of a small amount of phosphor copper, it is claimed, adds fluidity by lowering the melting point and so produces sound castings. It also reduces oxides.

So, for general foundry practice we suggest the use of plaster paris, common salt, and phosphor copper. These, we feel, will cover your requirements. We have never found any of the fancy-named fluxes to be of greater value in the foundry.

—W. J. R., Problem 3,908.

Gear Alloy Formula

Q.—Please advise me whether or not there is a better mixture for gear metal than 88-10-2. The castings concerned will be required to undergo tough usage and if there is a better mixture I would be glad to know the formula.

A.—The specification used by one of the largest users of worm gears is composed of:

Tin, 9.5 to 10.75; nickel, 1.25 to 2.25; lead, 0.25; phosphor, 0.25; copper, balance.

Make mixture as follows: Copper, 84.25 per cent; tin, 10 per cent; 15% phosphor-copper, 1.75 per cent; and 4 per cent of a mixture of 50 nickel, 50 copper.

The physical properties will run 35,000 to 40,000 lbs. tensile strength; elongation in 2 in., 6 to 10 per cent; Brinell hardness, 90 to 115.

Another very good gear metal is: 86 copper, 4 iron, 10 aluminum. This alloy is hard to handle. Unless you have had experience in handling this alloy we suggest the use of the tin alloy given above.

—W. J. R., Problem 3,909.

Tin-Plating Wire

Q.—At present we are silver plating copper wire and would also like to do some tin-plating. Please give us a formula.

A.—Formula for tin solution:

Sodium stannate	24 oz.
Sodium acetate	2 oz.
Caustic soda	1 oz.
Water	1 gallon.

Temperature, 150 to 160 F. The amperage will depend upon the time that it takes for the wire to pass through the solution, possibly it should be 10 to 20 amperes per square foot.

Tin being a very soft metal, you should have no more trouble with its use for your purpose than you do with silver.—O. J. S., Problem 3,910.

Saltetre Blue on Steel

Q.—Enclosed you will find sample of a small steel part which we are making for one of our customers. This customer requests that we supply this in blue steel finish.

We have been unable to arrive at a satisfactory method of bluing these parts, and would be pleased to receive any information you might be able to give us on the proper procedure to get this finish.

A.—The sample has been finished by what is known as the saltetre method, which is as follows:

The work is thoroughly cleansed of grease by tumbling with sawdust; it is then tumbled in an oblique iron barrel, using a solution of sodium carbonate 8 oz., sodium cyanide ¼ oz., water 1 gallon, until the work is bright. Dry thoroughly and immerse in molten sodium nitrate at temperature of 700 deg. F.

The sodium nitrate should be contained in an iron kettle and gas used to produce the heat necessary to melt the sodium nitrate. It will only take a few seconds to produce the blue color, after which the articles are plunged into cold water, dried, and then tumbled in sawdust moistened with paraffine oil.—O. J. S., Problem 3,911.

Correction

In the answer to problem No. 3,900 in the October issue, the words "potassium chromate" should have read "potassium iodide"; the number ".098" should have been ".0130".—Ed.

Patents

A Review of Current Patents of Interest

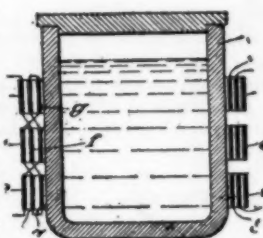
Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,720,894. July 16, 1929. **Tarnish-Resisting Silver Alloy, etc., and Process for Producing the Same.** Daniel Gray and Richard O. Bailey, Oneida, and William S. Murray, Utica, N. Y., assignors to Oneida Community, Limited, Oneida, N. Y.

A silver alloy or intimate mixture having a silver content of about 90 per cent or more and silicon in sufficient quantity to render the alloy or mixture substantially non-tarnishable.

1,721,073. July 16, 1929. **High-Frequency Induction Furnace.** Wilhelm Esmarch, Berlin-Halensee, Germany, assignor to Siemens & Halske, Aktiengesellschaft, Siemensstadt, near Berlin, Germany, a Corporation of Germany.

A high frequency furnace comprising a crucible and a primary coil inductively associated therewith, said coil consisting of a plurality of thin conducting insulated bands set on edge and arranged to form a laminated coil structure in which each lamination of the coil consists of a plurality of substantially equal lengths of each of said bands.



1,719,463. July 2, 1929. **Proofing Metal, Especially Iron and Steel, Against Rust.** William Howard Cole, Paris, France.

A proofing composition for metals, containing aluminum zinc, iron and chromium, consisting in a mixture of saturated solutions of these four metals in phosphoric acid and water.

1,719,464. July 2, 1929. **Proofing of Iron and Steel, Against Rust.** William Howard Cole, Paris, France.

The improvement in proofing of iron and steel against rust, which consists in preparing the processing solution from the four metals, iron, zinc, aluminum and chromium, by dissolving each of the metals or the oxide of chromium separately at a temperature not over 90° C. in a solution of phosphoric acid of 45° Bé. diluted with water to 22° Bé. until the said metallic phosphatic solutions are each of a density of 36° Bé, mixing these solutions together in the proportions: 1 part aluminum solution, 5 parts zinc solution, 5 parts iron solution and ½ part chromium solution.

1,719,649. July 2, 1929. **Pickling and Cleaning of Metal.** George D. Chamberlain, Ashland, Ky., assignor to R. T. Vanderbilt Company, Incorporated, New York.

The method of cleaning or pickling metals which comprises subjecting the same to a non-oxidizing mineral acid pickling or cleaning bath and inhibiting the chemical action of the acid on the metal without interfering with the removal of scale or oxide, and thereby reducing the formation of hydrogen and the production of acid fumes and effecting an economy in the acid consumed, by incorporating in the acid bath a small amount of a condensation product of an aldehyde with an amine.

1,719,650. July 2, 1929. **Pickling of Metals.** George D. Chamberlain, Ashland, Ky., assignor to R. T. Vanderbilt Company, Incorporated, New York.

The method of cleaning or pickling metals which comprises subjecting the same to a non-oxidizing mineral acid pickling or cleaning bath and inhibiting the chemical action of the acid on the metal without interfering with the removal of scale or oxide, and thereby reducing the formation of hydrogen and the production of acid mist and effecting an economy in the acid consumed by incorporating in the acid bath a small amount of an inhibiting amine.

1,719,764. July 2, 1929. **Die-Casting Machine.** John S. Gullborg, Chicago, Ill., assignor to Alemite Die Casting and Manufacturing Company, Chicago, Ill.

In a die casting machine, a die mold including a movable

section, means for operating said mold section, a plate mounted for movement with the mold section, link mechanism actuated by the movement of the mold section for moving the plate with respect to the mold section, stripping pins carried by the plate and slidable through the mold section, and stop means limiting the movement of the plate with the mold section in either direction for retracting and projecting the pins.

1,720,065. July 9, 1929. **Metal Packing.** Gustaaf Verdickt, Ghent, Belgium.

Alloy for joint packings and the like, composed of 5 parts lead, 1 part antimony and ¼ part zinc.

1,720,215. July 9, 1929. **Method of Producing Tarnish-Resisting Silver and Silver Plate.** Daniel Gray and Richard O. Bailey, Oneida, and William S. Murray, Utica, N. Y., assignors to Oneida Community, Limited, Oneida, N. Y.

The herein described processes of producing tarnish resisting silver or silver plate which consists in vaporizing mercury and exposing the silver or silver plate to such vapor in an atmosphere free of oxygen and other agents which would interfere with the absorption of the mercury by the silver or silver plate.

1,720,216. July 9, 1929. **Tarnish-Resisting Silver Plate and Process for Producing Same.** Daniel Gray and Richard O. Bailey, Oneida, and William S. Murray, Utica, N. Y., assignors to Oneida Community, Limited, Oneida, N. Y.

A silver-plated article in which the plating consists of an intimate mixture of silver and mercury with a silver content of about 90 per cent or over and mercury.

1,720,286. July 9, 1929. **Process for the Protection of the Surface of Baths of Easily-Oxidizable Metals Such as Magnesium.** Gilbert Michel, Bagneux, France.

A method of protecting the surface of a bath of easily oxidizable metal which consists in covering the free surface of the bath with a protective layer and covering the crust so formed with sulphur.

1,720,312. July 9, 1929. **Anode for Chromium Plating.** Frederick M. Becket, New York, N. Y.

A cast anode comprising chromium and about 0.5 to 7 per cent of carbon.

1,720,313. July 9, 1929. **Anode for Chromium Plating.** Frederick M. Becket, New York, N. Y.

In combination, an electrolyte consisting predominantly of an aqueous solution of chromic acid, and a substantially carbon-free anode comprising chromium and about 0.25 to 35 per cent of silicon.

1,720,354. July 9, 1929. **Method and Apparatus for Electrodepositing Chromium.** Kevie W. Schwartz, New York, N. Y., assignor to Chromium Corporation of America, a Corporation of Delaware.

An apparatus for electrodepositing metals such as chromium on the inside of hollow cathode articles, comprising an elongated anode having angularly displaced portions, whereby the gaseous products released at the cathode opposite one portion of the anode will not interfere with the deposition in the active zone or area of the adjacent anode portions.

1,720,436. July 9, 1929. **Process of Refining Magnesium and its Alloys.** Gustav Pistor, Leipzig, Germany, assignor to I. G. Farbenindustrie Aktiengesellschaft, Frankfurt-on-the-Main, Germany, a Corporation of Germany.

The process of refining magnesium and its alloys containing at least 85 per cent Mg which comprises stirring the molten metal with magnesium chloride and a substance adapted to act as a thickening medium on magnesium chloride, introducing into the molten metal calcium metal and mangamous chloride, and continuing the treatment until the refined metal contains 0.1 per cent of calcium at most and up to 0.4 per cent of manganese.

Equipment

New and Useful Devices, Machinery and Supplies of Interest

Variable Speed Buffer and Polisher

A new type of buffing and polishing machine which provides variable wheel speeds for varying classes of work has been placed on the market by The United States Electrical Tool Company, Cincinnati, Ohio. With this machine the operator can obtain the exact speed needed for any job rapidly and easily, according to

different sized discs revolve on the motor spindle. Any one of these (depending on the speed desired) can be quickly inserted into a stationary metal V-disc or sheave mounted on the wheel spindle, by releasing the cone by means of a foot pedal and moving it into desired position (by means of a lever and speed positions indicated on the front of the machine.)

These buffers provide a range of four speeds from 2,000 to 3,000 R.P.M., but additional speeds can be added if desired. Fig. 2 shows the cone disc arrangement.

Specifications show this buffer to embody a heavy one-piece chrome manganese steel wheel spindle, supported on four heavy duty "SKF" ball bearings. These bearings are enclosed by labyrinth seal in dust tight grease compartments. The motor is built



Fig. 1.—Variable Speed Buffer and Polisher

the makers. The machine, known as the "U. S. Multispeed Buffer and Polisher," is shown in the accompanying illustration. It is claimed that more than a year of exhaustive tests under actual operating conditions by the manufacturers have proven the machine entirely practical. Westinghouse engineers are also said to have made tests with it, reporting high efficiency for its drive. The principle is not new and has been embodied in other types of machines for some years, but this is the first time it has been applied to this field, according to the makers.

The method of transmitting the different speeds employs a V-disc transmission of graphitized micarta. A cone of series of

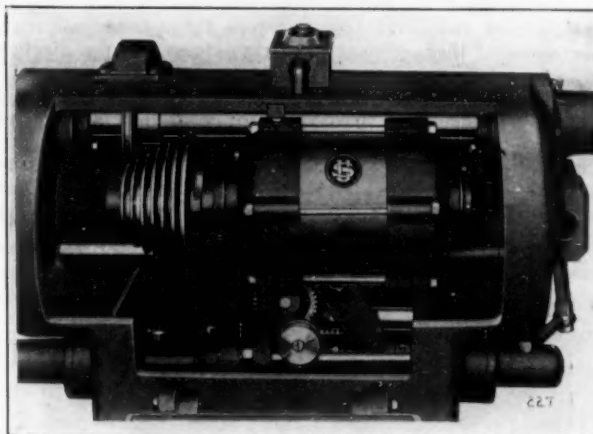


Fig. 2.—Inner Mechanism of New Variable Speed Machine

for continuous service. It is of 40 degree centigrade rating, with momentary overload capacity and operates at 3,600 R.P.M. Control is by push button mounted at top within easy reach of operator. Control has overload protection and no-voltage release.

The buffer is furnished in four sizes 1, 2, 3 and 5 horsepower, 220, 440, 550 volts, 2 or 3-phase, 25, 40, 50 and 60-cycle alternating current.

New Process of Spraying Tin

The possibility of preventing the deterioration of metal structures by spraying them with tin is being examined by the British Tin Industrial Applications Committee, an organization cooperating with the British Non-Ferrous Metals Research Association, according to an announcement by Doremus and Company, New York City, bankers. Those interested in the new process claim that tin can be sprayed cheaply upon tin, wood, glass, steel and many other surfaces.

"Our first concern will be to verify the results of recent experiments that go to show that pure tin sprayed upon a metal structure renders it proof against corrosion," says a statement of the committee.

"Since it has been stated that corrosion costs the heavy

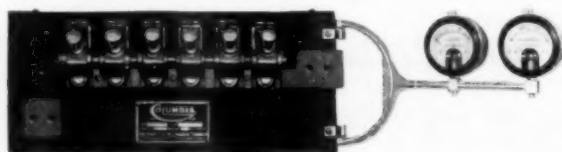
industries some \$2,500,000,000 a year, the matter deserves careful consideration.

"This method of spraying tin might also open up a new era in the manufacture of decorated fabrics for women's clothes and furnishing. Tin could be sprayed upon materials as delicate as silk, which afterwards, it is claimed, could be crumpled and washed without damaging the fabric or the metal design. Tin sprayed upon glass would make satisfactory and cheap reflectors and possibly mirrors; and novel effects in interior decoration could be obtained. Then there would be a wide use in tin-spraying the interiors of tanks, and receptacles used in the manufacture of food. It is the business of the Application Committee to examine any new process which they consider of commercial interest."

Cast Grid Tank Rheostats

The control of current through a plating solution is dependent in general upon the voltage on the tank and the current in the solution. The current required may vary from one to twelve volts, depending upon the chemical analysis of the solution; the size and type of anodes used; the quality and size of surface upon which the plate is to be deposited; the distance between anode and cathode and the temperature of the solution.

Since the generator is fixed, usually at six volts, nine volts or twelve volts, and as the amount of current in any given solution

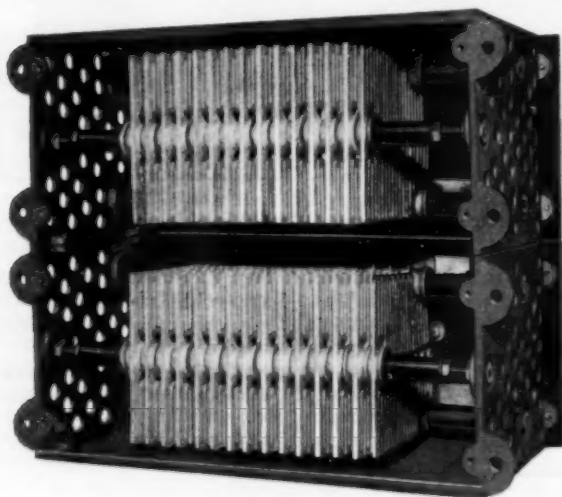


500 Ampere Cast Grid Tank Rheostat

depends upon the amount of anode and cathode surface exposed, it is important to have absolute control of the current and voltage in the solution, which control is effected by means of a tank rheostat.

A complete line of tank rheostats is offered by the Columbia Electric Manufacturing Company, 1292 East 53rd street, Cleveland, Ohio. These rheostats are made with cast grid resistor sections and, according to the makers, are of the same type that are used to control the current of slip ring induction motors, direct current crane motors and direct current adjustable speed motors, etc. The general use of cast grid type resistors throughout industry is definite proof of their efficiency and ruggedness, the manufacturer states.

It is claimed that these cast grids are uniform in cross section and each grid is tested separately for resistance and current capacity. They are mounted in rear of panel on three mica insulated tie-rods which are suspended and insulated from the ventilated end plates. The rigid three point grid support eliminates breakage caused by sagging or vibration. The grids are protected from accidental damage by ventilated enclosures.



Construction of a 1,000-Ampere Cast Grid Tank Rheostat

Voltmeter and ammeter are mounted on a swinging bracket attached to the side of rheostat panel. Instruments can be moved to allow reading from any angle. Columbia cast grid rheostats are manufactured in standard sections of 800 amperes capacity or smaller. These sections are mounted together for sizes of 1,000, 1,500, 2,000 amperes capacity and larger.

Aluminum Solder and Aluminum

While each year sees a steadily increasing use of aluminum and its many alloys in the fabrication of mechanical parts, castings and sheet work, it still remains the most difficult of all metals to join and repair. The common practice of welding aluminum by fusion methods, with the attendant dangers of dis-

tortion corrosion and wilting, leaving a great deal to be desired.

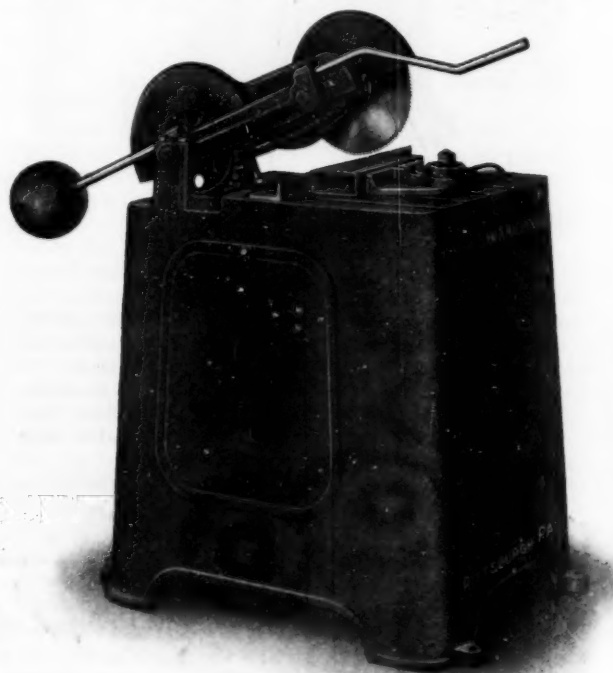
An aluminum-joining medium has been placed on the market by the Marshall Metal Company, 407 East Pico Street, Los Angeles, Cal., which is stated to be the result of years of experiment. The material, known as "Bulldog Aluminum Solder," is said to produce in aluminum and aluminum alloys joints that are equal in tensile strength with fusion welds, while at the same time eliminating the undesirable features of such welds. It is claimed that the material has proven practicable in seven years of service tests. The solder is said to contain no flux, phosphorus, cadmium or bismuth.

This material is applied at a heat of about half the fusion point of aluminum, requiring no flux in application, making preheating or heat-treating unnecessary. According to the makers, the material is now used strictly as a solder, since soldering implies the diffusion of a liquid alloy into a solid material and the resulting bond being only on the surface. Welding involves actual fusion of the surfaces joined. With the "Bulldog" solder, it is stated, makes joints resembling both ordinary solder and welding. It can be used by any mechanic, although the result is said in reality to amount to a weld. The company offers to supply test results and other technical data on request. Samples may also be had.

The solder is made in several grades such as Standard, with melting point at 650° F., for all standard aluminum and aluminum compositions; No. 1, for duraluminum, melting point 400° F.; Grade B, for duraluminum or aluminum subjected to sulphuric acid bath, melting point 400° F.

Cut-Off Saw for Brass and Bronze

A new type of saw for cutting brass, copper, bronze and other alloy bars has been developed by the Bunter Saw and Machine Company, Pittsburgh, Pa. This saw is capable of cutting off 3-inch bars in 3 to 4 seconds, according to the manufacturer. Angular as well as straight cuts can be made on bars, rods, pipe, tubing, etc., up to 3 inches in diameter. The machine is equipped with a blade driven by a 3-horsepower motor through a roller

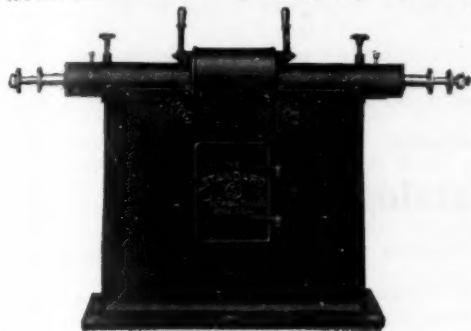


Rapid Cut-off Saw for Metals

chain and sprockets, with means of keeping the chain at best working tension. The saw is said to be mounted on a perfectly balanced tilting frame and is fed through the material by an off-side hand lever. The base contains the motor and starter. A quick-acting eccentric vise clamps the work during the cutting operation. The saw has an adequate guard which lifts out of the way for saw removal. Model No. 4 of this machine is shown in the illustration.

Two-Motor Buffer and Polisher

Illustration shows the new "Standard Right-Speed Two-Motor" buffer and polisher, which is manufactured by The Standard Electrical Tool Company, Cincinnati, Ohio. This machine is made in 3, 5 and 7½ horsepower sizes. Any speed from 2,000 to 3,000 R.P.M. can be obtained by changing pulleys on motor shaft.



Two-Motor Polisher

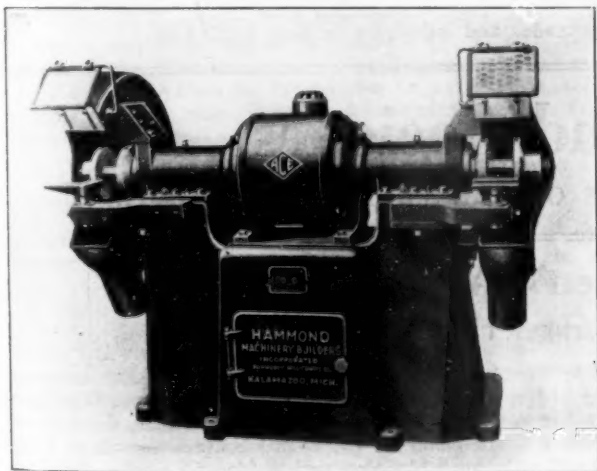
This buffer has two motors in the base, each mounted on a hinged base plate which has an adjustable screw to take up the tension of the "Dayton" cog belts which are used. These belts run in V-grooved cast iron pulleys.

The spindles are made of a high grade nickel steel. The bearings are "SKF" ball bearings and are mounted in dust proof chambers. All bearings run in oil. Each spindle is fitted with hand brake for stopping quickly, and also with shaft lock for locking shafts when changing wheels. Spindles can be furnished any length as desired.

The motors are General Electric, 40 degree, ball bearing, and each motor has independent push button control. The back of machine is made of heavy sheet metal, hinged to base so it can be raised easily, permitting full view and access to entire machine.

Heavy Duty Electric Grinders

Hammond Machinery Builders, Inc., Kalamazoo, Mich., formerly the Hill-Curtis Company, has placed on the market a line of heavy duty grinders having 4 ball bearings and rated variously as 5, 7 and 10 horsepower. These grinders are furnished for 220, 440 or 550 volt current, 2 or 3 phase, 25, 40, 50 and 60 cycle, alternating current; and 110, 220 and 550 volt in direct current. The machines have been designed to meet the demand for maximum power and rigidity. They are equipped with totally



Heavy Duty Grinder

enclosed motor, fitted with patented air cleaner, four oversize ball bearings mounted on extra heavy chrome-manganese steel spindle. Automatic motor starter, having thermal overload protection and low voltage protection with push button control conveniently mounted on the pedestal is standard equipment. Approved, adjustable, boiler-plate steel wheel guards with hinged doors; exhaust pipe connection, adjustable spark and chip breaker and eye shield are also standard equipment. The complete guard is adjustable to the wear of the grinding wheel, permitting maximum working space with protection to operator. Grinding wheels are not regularly supplied, but can be furnished to order.

New Electric Acid Pump

The Belke Manufacturing Company, 2952 Van Buren street, Chicago, Ill., announce a new electric acid pump that is said to be a highly practical and positive equipment. It is composed of a pump and a motor connecting with a pipe which is fitted into the carboy. The acid is pumped from the carboy to the container to be filled.

The manufacturers claim this electric acid pump does exceedingly fast work, eliminates the danger of burning hands with acids and also does away with much physical work. After the lead pipe is placed in the carboy, the pressure of a finger starts the flow of acid through the lead delivery pipe, and another pressure of the finger instantly stops the flow and returns all residue of acid in the pipe back into the carboy by air pressure.

The control of the flow is said to be so perfect that there is no dripping or leaking and waste of acid. There is no vibration or noise in operation. The equipment handles all acids and can be quickly changed from carboy to carboy. Because of its safety advantages, say the manufacturers, this acid pump is recommended by underwriters. Construction is simple and strong, it is claimed, with no moving parts to cause trouble or wear out.

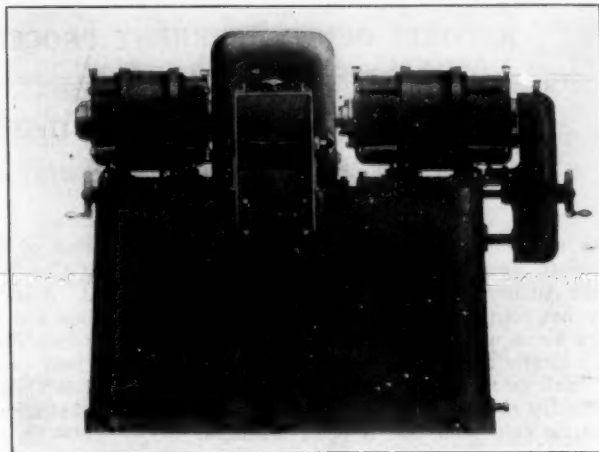


Electric Acid Pump

Automatic Double Disc Grinder

Of interest to manufacturers of bronze bushings, piston pins, piston rings, springs and many others in allied lines of production, will be the new automatic double disc grinder developed by the Cleveland Armature Works, Inc., Cleveland, from the design of its chief mechanical designer, J. A. Brady. This new design of automatic disc grinder has a separate motor for each disc. The motor shaft is the spindle for the disc. These two motors are 7½ horsepower, designed and built by the Cleveland Armature Works. The shaft is chrome-nickel steel, heat treated and ground. The disc, shaft and rotor complete are both statically and dynamically balanced and are mounted on Timken roller bearings which are easily adjustable for wear.

The two motors operate from a single push button station. All



Automatic Double Disc Grinder

motors start simultaneously and build up speed at the same rate. The feed is driven by a separate motor enclosed in the base. The drive is through nickel steel heat-treated spur gears and the final reduction through a hardened and ground worm and phosphor bronze-worm-wheel. The entire drive is self-lubricating.

All operating parts are entirely enclosed and conform to safety code requirements. The machine requires no attention of the operator and its capacity is limited, on small bushings, only by the speed at which the operator feeds the work in the magazine.

Three different feeds also are provided through change gears which should give the following production: small bushings, 4,000 per hour; medium bushings, 2,700 per hour; large bushings, 1,800 per hour.

The grinder is furnished complete in every detail including starter, push button controls, 20 inch diameter abrasive discs and all other parts essential to operation of the machine.

Thomas' Register Re-issued

Thomas' Register of American Manufacturers, the well known comprehensive directory, is being re-issued shortly, completely revised and brought up to date, by the Thomas Publishing Company, New York City. The book lists all American manufacturers, all American products and all brand names, in different lists, making the book a handy means of locating brands or their makers, as well as showing makers of all products under their common names. The use of different colors for pages of the several sections adds to the facility with which the book can be used. The book is priced at \$15 and is available from THE METAL INDUSTRY.

Equipment and Supply Catalogs

Eighty-fifth Anniversary. Laclede-Christy Clay Products Company, St. Louis, Mo. Leaflet.

Velvet Smooth Starting for Squirrel-Cage Motors. Allen-Bradley Company, Milwaukee, Wis. Leaflet.

Pickl-Aide. The Weaver Brothers Company, Adrian, Mich. Small note-book, with some data relative to pickling, etc.

Weldite Type-S Welding Rod. Fusion Welding Corporation, Chicago, Ill. Illustrated leaflet on non-corrosive welding material.

Machines that Pay Profits. The Brown Instrument Company, Philadelphia, Pa. Illustrated leaflet on temperature control apparatus.

The Balancing of Grinding Wheels. Norton Company, Worcester, Mass. Technical material on use of abrasive wheels; 24-page booklet.

Nuttall Heat-treated and Hardened Gears. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Folder No. 5223, illustrated.

Duriron Kettles and Tanks. The Duriron Company, Inc., Dayton, Ohio. Leaflet on non-corrosive equipment. **Centrifugal Pumps,** for corrosive liquids.

Design Standards for Oxwelded Steel and Wrought Iron Piping. The Linde Air Products Company, 30 East 42nd Street, New York City. 68-page illustrated book.

Electric Controlling Apparatus. Allen-Bradley Company, Milwaukee, Wis. A complete, tabulated catalog in loose-leaf binder. The new issue brings the Allen-Bradley catalog up-to-date.

Commutator Maintenance. Ideal Commutator Dresser Company, Sycamore, Ill. Data on resurfacing and repairing com-

mutators for generators, with considerable other electrical information.

Chemical Facts Instantly Available. D. Van Nostrand Company, Inc. 250 Fourth Avenue, New York City. Catalog of technical books on various subjects, including enameling, lacquering, etc.

Meeting Metal Requirements of Process Industries. The International Nickel Company, New York City. Corrosion data; a table of known and established users of nickel and Monel metal for corrosion-proof purposes; 16 pages, illustrated.

Monarch Lathes. The Monarch Machine Tool Company, Sidney, Ohio. The installation and maintenance of Monarch machines is fully described in a handsome, 20-page book; fully illustrated; has a chapter on questions and answers for lathe operators.

Cutting 3 Finishing Operations by the Dry Method. The Lea Manufacturing Company, Waterbury, Conn. Booklet describing fully the use of "Greaseless Compound" for producing brush brass, satin, colonial and other finishes direct from wheel to lacquer. Complete data, with illustrations, are furnished; free on request to the company.

Merchants' Association Year Book—1929. The Merchants' Association of New York, 233 Broadway, New York City. In addition to the reports covering the activities of the Association for the year, the book contains alphabetical and classified lists of the enrollment as of September 12, 1929. The membership on that date was 7,749. The alphabetical and classified list of members is regarded as a highly valued directory of the trades and industries in New York City.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Foundrymen's Association

HEADQUARTERS, 222 WEST ADAMS STREET, CHICAGO, ILLINOIS

Convention News

As previously announced, the next annual convention of the American Foundrymen's Association, will take place at Cleveland Public Auditorium, Cleveland, Ohio, May 12 to 16, 1930. A statement has been issued to the effect that in the auditorium and its annex there will be practically unlimited facilities for exhibition and educational purposes. There will be rooms for both large and small meetings as well as for the large commercial exhibition of foundry equipment and supplies and the extensive technical and education exhibition that is being arranged.

New Publication

The Association is now carrying out a vote for ratification of certain amendments to the by-laws and, according to C. E. Hoyt, executive secretary, this ratification will provide larger revenue through a more satisfactory classification of the membership. The added revenue will help the convention as well as other activities of the Association such as the new publication described below.

The Board of Directors of the Association has unanimously approved a monthly publication of the American Foundrymen's Association in which shall be printed the Transactions, including papers and discussions at the annual conventions. It is felt that this will make available in convenient form for reading the distribution important papers and reports. The Transactions will also be available in bound volumes at cost of binding. The date of the first issue of the new publication will be January 15, 1930. The publication will take the place of the Quarterly Bulletin, the last number of which will be issued in November.

The Association invites the cooperation of all members of the industry in furthering and advancing the science of foundry work through improved methods. This can be done through the contribution of personal experience and knowledge, by, presenting papers, participating in discussions and in many other ways that will promote the technical interests of the industry. Foundrymen should especially attend the annual conventions and arrange to present papers or exhibits if possible.

American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

Report on Research Fund

The report of the treasurer of the Research Fund of the American Electroplaters' Society for the year 1928-29, which ended May 31, shows that \$6,421.16 was spent during that fiscal period. The balance as of June 1, 1929, was \$4,539.35, as compared with \$6,828.30 on hand June 1, 1928. The difference was due to the fact that receipts for the year were smaller than in the preceding year and also because more money was spent for the research work. The total receipts for the year were \$4,050. One of the reasons for the decline in contributions was the fact that a number of subscribers to the fund paid up in full at the start and thus had their contributions credited to the 1927-28 total, although part of it might have been held over for the 1928-29 year. The condensed financial report of the treasurer is as follows:

Research Fund, Treasurers Financial Report

June 1, 1928, to May 31, 1929

RECEIPTS

June 1, 1928, Balance on hand.....	\$6,828.30
From subscribers	4,050.00
Interest on bank deposits	82.21
Total Receipts	\$10,960.51

DISBURSEMENTS

W. P. Barrows (Salary)	\$3,025.00
H. L. Farber (Salary)	2,425.00
W. P. Barrows (Travel Expense)	484.28
H. L. Farber (Travel Expenses)	384.82
Printing Expense	45.00
Compensation Insurance	44.56
Treasurer's Bond Premium	12.50
Total Expenses	6,421.16
Cash Balance in Treasury, June 1, 1929..	\$4,539.35

Convention News

A report from the Pittsburgh district states that there will be an air-minded delegation from that sector to the 1930 convention of the society, to be held at Washington, D. C., next July. According to the statement, some of the Pittsburgh branch members are planning to come to Washington in an airplane, the latest thing in transportation. Complete details of this are not available, but will be published as soon as they are in hand.

Los Angeles Branch

HEADQUARTERS, CARE OF M. D. RYNKOF, 1354 WEST 25TH STREET, LOS ANGELES, CALIFORNIA

Charter Granting Celebrated

The Los Angeles Branch was granted a permanent charter and is now a full-fledged branch of the American Electroplaters' Society. This event was fittingly celebrated by a dinner and smoker on October 12, to which plating employers and their representatives were invited. There were 110 men at the affair, which followed a regular Branch meeting. After a short business session, C. E. Thornton, president of the Branch, turned over the meeting to Frank C. Rushton, chairman of the entertainment committee, who gave an address in which he outlined the Society's objects and advantages of membership in it. This was followed by presentation of the following papers:

More Perfect Metal Products, by Dr. Watts, read by Joseph Corbit from the Electroplaters' Review, May, 1928.
Some Observations on Chromium Plating, by E. D. Bedwell.
Whither Are We Drifting? by M. D. Rynkofs.
Motion Plating, by George Kyle.
Aluminum and Chrome, by Benjamin Foss.
Testing Solutions, by P. A. Boeck.

A large delegation was present from Ontario, Cal., headed by

J. Jacques, sergeant-at-arms of the Branch. Alhambra, Pasadena, Santa Ana, Santa Barbara, and San Francisco were also represented. Between papers the meeting was enlivened by music and other entertainment. There was considerable discussion after the meeting adjourned.

M. D. RYNKOF, Secretary.

Newark Branch

HEADQUARTERS, CARE OF GEORGE REUTER, P. O. BOX 201, NEWARK, N. J.

Special Meeting

An open meeting of the Newark branch was held October 18. George B. Hogaboom, an associate editor of THE METAL INDUSTRY, well known electroplating expert, was the evening's speaker. His subject was "Brass Plating."

There were between 50 and 60 members and guests present at the meeting, which was a complete success. Following the usual custom, the Branch served excellent refreshments and there was considerable fun mixed in with the more serious side of the affair. Nevertheless, those present were agreed that the amount of valuable technical knowledge to be picked up at meetings such as these is astonishing.

New York Branch

HEADQUARTERS, CARE OF JOHN E. STERLING, 2581 FORTY-SIXTH STREET, ASTORIA, L. I.

Dr. Pan Lectures at Meeting

A meeting of the New York branch of the American Electroplaters' Society was held on October 11, at which 90 were present, including a large delegation from the Newark branch.

Dr. L. C. Pan, who is instructor of the plating class of the College of the City of New York, was the speaker for the evening. Dr. Pan's talk on **Anodes in a Chromium Plating Solution** was very interesting and brought forth much discussion on chromium plating. At the close of the meeting Dr. Pan was presented with a gold emblem of the Electroplaters' Society, and was made an honorary member of the Branch.

Messrs. Smith, Sievering and Sizelove of the Newark Branch were called upon for a few remarks. Mr. Wagner of the Newark Branch invited the members of the New York Branch to attend an open meeting of the Newark Branch, held on October 18, at which George B. Hogaboom, well-known plating expert, was the speaker of the evening. His subject was **Brass Plating**.

Joseph Haas to Speak

At the meeting of the branch on October 25, the chief speaker was **Joseph Haas**, well-known plating expert and formerly instructor of the New York Branch electrochemistry class. His subject was **The Foreman Plater and His Job**, on which Mr. Haas is very well informed.

Philadelphia Branch

HEADQUARTERS, CARE OF PHILIP UHL, 2432 NORTH 29TH STREET, PHILADELPHIA, PA.

Fifteenth Annual Banquet, November 23

The fifteenth annual banquet and educational session of the American Electroplaters' Society will take place Saturday, November 23, 1929, at McCallister's, 1811 Spring Garden Street, Philadelphia.

The session will begin at 3:00 p. m. and the banquet at 7:00 p. m. The chairman of this year's session is to be Dr. Hiram Lukens of the University of Pennsylvania. There will be a program of lectures by a number of authorities on electroplating and allied sciences, as follows:

How the Branches of the Society Can Best Further Its Interests and Theirs, by Charles H. Proctor, Roessler and Hasslacher Chemical Company, New York.

Inhibitors and Pickle Control, by Alfred Douty, American Chemical Paint Company, Ambler, Pa.

Cadmium Plating, by Clayton M. Hoff, Grasselli Chemical Company, Cleveland, Ohio.

Corrosion Tests of Electrodeposited Metals, by Norman Gebert, American Chain Company, York, Pa.

Throwing Power in Chromium Plating, by Dr. William Blum, Bureau of Standards, Department of Commerce, Washington, D. C., and Associate Editor, THE METAL INDUSTRY.

Control of Hydrogen Ion Concentration in Solutions for Nickel Deposition, by Dr. A. Kenneth Graham, Harrison Laboratory of Chemistry, University of Pennsylvania, Philadelphia, Pa., and Associate Editor, THE METAL INDUSTRY.

Question Box, conducted by George B. Hogaboom, Hanson-VanWinkle-Munning Company, Matawan, N. J., and Associate Editor, THE METAL INDUSTRY.

Pittsburgh Branch

HEADQUARTERS, CARE OF S. E. HEDDEN, 227 FIFTH STREET, ASPINWALL, PA.

Will Fly to Annual Convention

More than a dozen Pittsburgh Branch members have signified their intention of going to the annual convention at Washington, D. C., next July by the very latest means of transportation, the airplane. It is reported, on good authority, that the originator and developer of this scheme is none other than Wilfred S. ("Sulphur Mac") McKeon, president of the Sulphur Products Company, Greensburg, Pa., who stated at a recent meeting of the Branch that he was confident at least two twelve-passenger planes would be needed to carry the Pittsburghers to the convention, not to mention the train service that would be required by the less adventurous members.

Rochester Branch

HEADQUARTERS, CARE OF CHARLES GRIFFIN, 24 GARSON AVENUE, ROCHESTER, NEW YORK

Open Meeting Held

The Rochester Branch held an open meeting at Poucher's Hotel, Rochester, September 27. There was a very good attendance and some fine addresses were heard.

Horace H. Smith, supreme president of the Society was present and gave an interesting talk on the plans of the Society for the coming year.

Dr. Harold Work of the Aluminum Company of America, Pittsburgh, Pa., delivered an especially fine lecture on **Nickel and Chromium Plating of Aluminum**.

Frank C. Mesle and **S. P. Gartland**, past supreme presidents, were present and gave short talks.

Dr. E. B. Sanigar of Sheffield, England, first recipient of the Weston Fellowship of the American Electrochemical Society, under which he is now engaged in research on plating at Columbia University, was present. He gave a short talk on **Electroplating Methods in Great Britain**.

George B. Hogaboom, electroplating expert and an associate editor of THE METAL INDUSTRY, conducted his famous **Question Box** and as usual provided a great deal of interest and brought out much valuable information.

Annual Outing and Clam Bake

On Saturday, September 28, the Rochester Branch held its annual outing and clam bake at the Old Homestead on Irondequoit Bay. Sports of all kinds were carried on. The feature of the day was a ball game between President Reama's Red Wings and Vice-President Hart's Colts. The Reama team won after 11 innings, but the game was disputed as the umpire was found unsatisfactory. Special mention should be made of the pitching of William Hart for the losers and the catching of Judson Elster for the winners. During the dinner and for the dancing that followed the Melody Boys Orchestra provided the music.

October Meeting at Syracuse

The October meeting of the Branch was held at Syracuse, N. Y., Saturday evening, October 26.

Frank C. Mesle of Oneida, N. Y., was scheduled to deliver a lecture on **Silver Plating**. This meeting is being held as this issue goes to press.

Materials Testing Society

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

1930 Annual Meeting, Atlantic City

The 1930 annual meeting of the American Society for Testing Materials will take place at Haddon Hall, Atlantic City, N. J., from June 23 to 27, inclusive, it was decided at a meeting of the Executive Committee on October 8. Chicago had been considered, but it was found that the month of June would not be opportune for a meeting in Chicago, due to meetings there of other large societies that month. However, it was determined that the 1931 meeting would be held at Chicago, over the dates of June 22-26, 1931.

The new Haddon Hall will be used the coming year and its facilities are remarkably well suited to such an event. The entire top floor has been designed for meeting purposes and this will be used by the Society. The whole convention, practically, will be housed at Haddon Hall, too, which is an added advantage.

A new policy has been adopted of determining at least 18 months in advance the time and place of annual meetings.

Copper and Branch Research Association

HEADQUARTERS, 25 BROADWAY, NEW YORK CITY

Annual Meeting—New Officers

The Copper and Brass Research Association held its ninth annual meeting at its offices last month, re-electing as president R. L. Agassiz, chairman of the Calumet and Hecla Consolidated Copper Company, Boston, Mass. The following were elected vice-presidents: Frederick S. Chase, president of Chase Brass and Copper Company, Inc., Waterbury, Conn.; Walter Douglas, president of Phelps Dodge Corporation, New York; H. Donn Keresey, of Anaconda Copper Mining Company, New York; Thomas D'A. Brophy, Rome Brass and Copper Company, Rome, N. Y. The treasurer is Stephen Birch, president of Kennecott Copper Corporation. William A. Willis continues as manager of the Association, in which position he has been retained since its formation; Bertram B. Caddle was re-elected secretary.

The following brass and copper fabricating companies are members of the Association: The American Brass Company; Bridgeport Brass Company; Chase Brass and Copper Company, Inc.; T. E. Conklin Brass and Copper Company, Inc.; Dallas Brass and Copper Company; Foster Wheeler Corporation; C. G. Hussey and Company; Mueller Company; The National Brass and Copper Company; New England Brass Company; New Haven Copper Company; New Jersey Wire Cloth Company; The J. M. and L. A. Osborn Company; The Paper and Textile Machinery Company; Rome Brass and Copper Company; Scovill Manufacturing Company; Taunton-New Bedford Copper Company; Wolverine Tube Company.

Waste Material Dealers

HEADQUARTERS, 1109 TIMES BUILDING, NEW YORK CITY

Fall Meetings

Fall meetings of the National Association of Waste Material Dealers, Inc., were held at the Hotel Astor, New York City, October 22.

The Metal Division of the Association held a meeting at which most of the scrap metal concerns of the country were represented. A change was made in the official scrap classifications, item 35, from which were excluded two materials: ornamental metal and casket metal. This class includes bab-bitt metal, etc. Freight rates were given considerable discussion.

The Salvage Division meeting consisted of a general discussion of waste material reclamation. The chairman, R. W. Phillips of E. I. du Pont de Nemours, Wilmington, Del., presided.

Ornamental Iron and Bronze Makers

HEADQUARTERS, 1331 G STREET, N.W., WASHINGTON, D. C.

The National Association of Ornamental Iron and Bronze Manufacturers held its twenty-second annual convention at the Hotel Jefferson, St. Louis, Mo., October 8 to 11. The program included the following speakers:

Harry F. Huff, manager, Kenosha, Wis., branch of the American Brass Company, on "History and Progress of Anaconda Extruded Metals"; Dr. Hugh P. Baker, manager, Trades' Association Department of the United States Chamber of Commerce, on "Trade Associations and American Business"; Harry A. Einstein, representative, Credit Clearing House Adjustment Corporation, New York, on "The Value of the Trade Association Credit and Collection Service," and C. C. Johnston, credit manager, St. Louis branch of Joseph T. Ryerson and Sons, Inc., on "Cost Accounting."

British Institute of Metals

HEADQUARTERS, 36 VICTORIA STREET, WESTMINSTER, LONDON, S. W. 1, ENGLAND

Meetings to Be Held in 1930

March 12—Twenty-second Annual Meeting, 10 a. m. in the Hall of the Institution of Mechanical Engineers, Storey's Gate, London, S. W. 1.

March 12—Annual Dinner and Dance, 6.45 p. m., at the Trocadero Restaurant, Piccadilly Circus, London.

March 13—Annual General Meeting (contd.), 10 a. m., in the Hall of the Institution of Mechanical Engineers.

May 7—Annual May Lecture (to be held in London).

September—Annual Autumn Meeting (to be held in England).

Papers for the March meeting should be received by October 31, 1929, and for the September meeting by April 30, 1930.

Elections to membership are due to take place on November 7, December 19, 1929; January 16, February 20, April 10, May 7, July 3, and September 2, 1930. Applications for membership should be made on Form "A".

G. SHAW SCOTT, Secretary.

British Electroplaters and Depositors

HEADQUARTERS, NORTHAMPTON POLYTECHNIC INSTITUTE, ST. JOHN STREET, LONDON, E. C. 1, ENGLAND

Program for Session 1929-30

The program of the new session of the Electroplaters' and Depositors' Technical Society, of Great Britain, which opens this month, has just been issued by the secretary. The new session is the fifth in the existence of the Society, and the remarkable progress which the society has made during its comparatively short existence is reflected by the many excellent features listed among the coming activities.

Among the most notable items is the **Joint Meeting** which will be held in conjunction with the **Faraday Society** with which this society is associated. It is anticipated there will be a repetition of the highly successful conjoint meeting which was held last year at the society headquarters, Northampton Polytechnic Institute, Clerkenwell. At this meeting, which is to be held in December, interesting papers on phases of **Copper** and **Silver Deposition** will be presented by Messrs. B. Clark and E. O. Jones, and S. Glasstone and E. B. Sanigar, respectively.

The most interesting item, however, is a proposed all-day convention on the last day of January, in London, this function being in lieu of the Provincial Meeting which has been held successively in past years—twice in Birmingham (the nickel plating centre) and once in Sheffield (the home of silver plating). The program for the convention will include the following attractive features:

An address by **Dr. W. Rosenhain, F.R.S.**, the eminent metallurgist on "Research and Practice"; a general discussion on the present position of **Chromium Plating**; and an **Exhibition** representing modern scientific and practical advances in electroplating, to be held at the Northampton Institute, which is situated in the centre of the London plating industry. With

regard to the exhibition, it is hoped to obtain the active co-operation of prominent firms in the industry displaying apparatus and finishes indicative of recent advances in technique, with particular reference to electrodeposition, while the part which the industry plays in the production of art products would also be represented. It is possible that this exhibition may be on view for a longer period than the actual date of the convention.

Papers to be presented cover the deposition of most of the metals commonly deposited—nickel, copper, cadmium, zinc, chromium—while of special interest are the projected papers on **The Electrodeposition of Zinc on Aluminum and Its Alloys**, by **Dr. H. C. Cocks**, summarizing the work upon this subject which is at present being carried out at the Research Station at Farnborough; and **The Hardness and Polishing of Electrodeposits**, by **D. J. MacNaughton** and **A. W. Hotherhall**, presenting some interesting results of work carried out at Woolwich. The **Round Table Conference** to be held in June is in response to a unanimous demand for a repetition of a highly successful meeting along similar lines which was tried as an experiment last session and which received very favorable comment in the technical press.

The opening meeting of the session takes place on October 16th. **H. Sutton, M.Sc.**, will present a paper on **Recent Development in Protective Coatings for Metals**.

The Journal

Year by year the number of papers presented and the quality of the matter published has shown improvement. Volume IV of the society's **Journal** is to be issued this month. It contains over 150 pages of valuable information in many phases of electrodeposition in the form of papers of both theoretical and practical value, written by experts and specialists. The price of this bound volume is 10s. 6d. to members and 15s. to non-members.

The complete programme for the new session is appended:

Program of Meetings for Session 1929-30

OCTOBER 16: Recent Development in Protective Coatings for Metals, by H. Sutton.

NOVEMBER 13: Annual Meeting—Presidential Address, by Dr. R. S. Hutton.

DECEMBER 11: Joint Meeting with Faraday Society. Papers include: Effect of Addition Agents in Copper Sulphate Solution, by B. Clark and E. O. Jones. The Electrodeposition of Silver from Argento Cyanide Solutions, by S. Glasstone and E. B. Sanigar.

JANUARY 8: Electrolytic Gold Refining, by E. Downs.

JANUARY 31: London Conference—Address by Dr. W. Rosenhain, F.R.S.: Research and Practice. Exhibition representing modern scientific and practical advances in electrodeposition. General Discussion on Present Position of Chromium Plating.

FEBRUARY 26: Hardness and Polishing of Electrodeposits, by D. J. MacNaughton, A. Inst., and A. W. Hotherhall.

MARCH 26: The Electrodeposition of Zinc on Aluminum and Its Alloys, by Dr. H. C. Cocks.

APRIL 30: Resistance of Electrodeposits to Corrosion, with Special Reference to Cadmium and Zinc, by Dr. W. H. Patterson.

MAY 21: Mass Production Methods in Depositing Nickel at High Current Density, by C. J. Morley and N. R. Laban.

JUNE 11: Annual Election. Round Table Conference on Electroplating; problems raised by members.

New Committee

The new committee, elected at the end of last session, is now constituted as follows:

PRESIDENT—Dr. R. S. Hutton.

VICE-PRESIDENT—D. J. MacNaughton.

HONORARY TREASURER—W. James.

HONORARY SECRETARY—S. Wernick.

COMMITTEE: S. Field, G. E. Gardam (Assistant Honorary Secretary), L. Goring, A. W. Hotherhall, F. L. James, H. Lovelock, G. S. W. Marlow.

Of the above gentlemen, Messrs. Field, MacNaughton and Marlow (Secretary of the Faraday Society) act as representatives of the Faraday Society.

BRITISH CORRESPONDENT.

Personals

E. G. Lovering

E. G. Lovering, who recently accepted a post on the staff of Frederic B. Stevens, Inc., of Detroit, Mich., has followed electroplating ever since he was a boy. His early days were spent in the New England states, his first connection with the plating industry being in the plating room of the Wire Goods Company of Worcester, Mass. After that he was for a short time with the Iver Johnson Arms Company. At the age of 20 he was foreman of the polishing and plating department of the Cycle Improvement Company of Westboro, Mass., which later moved to Keene, N. H., and was known as the Trinity Cycle Company, manufacturing a bicycle and a steam motor car called the "Steammobile."

Mr. Lovering then spent several years with the Buick Motor Car Company as foreman of the plating and polishing department, first in Jackson, Mich., and then in Flint. Mr. Lovering installed complete plating and polishing plants in both of these locations. He left the Buick Company to go to the Edmunds and Jones Lamp Company, where he was the head of their polishing and plating operations for nine years. He left them to go with the Ternstedt Manufacturing



E. G. Lovering

Company in Detroit, with whom he remained for about a year, then joining Frederic B. Stevens, Inc., also in Detroit.

Mr. Lovering is known widely as an expert on practical electroplating with a knowledge of the chemistry of plating. He is serving Frederic B. Stevens, Inc., as a plating and polishing engineer. He has a host of friends through the United States and Canada and is one of the prominent figures of the American Electroplaters' Society, taking a leading part in making arrangements for the excellent convention which was recently held in Detroit.

Owen D. Young, chairman of the General Electric Company, Schenectady, N. Y., world famed for his work on the war reparations problem, was presented with one of the three Roosevelt Medals for 1929 at a dinner at 28 East Twentieth Street, New York City, the house where Theodore Roosevelt was born. The medals were presented after a day in which there were ceremonies celebrating the seventy-first birthday of the famous rough rider and President.

C. A. Thomas, Jr., formerly a student at Ohio State University, has been added to the staff of the Ferro Enamel Supply Company, Cleveland, Ohio. **J. A. Thompson**, formerly with the Sebring Manufacturing Corporation, has been added to the company's ceramic service staff.

Robert F. McGill has been appointed western manager of Aluminum Industries, Inc., with headquarters at the company's branch at San Francisco, Calif. **Edward R. Brazel** has been appointed district manager and will be at the same office.

Correction

In a personal note on E. S. Bassett, president of the Cowles Detergent Company, Cleveland, Ohio, contained in the September issue, an unfortunate typographical error occurred in that Mr. Bassett was stated to be taking a European tour with Mrs. Cowles. This should have read: Mrs. Bassett. The editor regrets the deplorable mishap and makes abject apology to those concerned.

Obituaries

Joseph F. Kirn

Joseph F. Kirn, pioneer Philadelphia foundryman, died October 21, 1929, after two months' illness.

Mr. Kirn was born in Philadelphia sixty-two years ago and received his education at the public schools there. In 1896 he founded the firm of M. L. Kirn and Brother, brass manufacturers, at 2137 North Lawrence Street. At the time of his death he was president and treasurer.

Mr. Kirn was active in the Philadelphia Board of Trade, the Philadelphia Foundrymen's Association and the Metal Manufacturers Association.

He is survived by his wife, Mrs. Elizabeth Kirn; a son, Stanley C. Kirn; a brother, William F. Kirn, and two sisters.

George Rockwell

George Rockwell, 81 years old, secretary and director of the International Silver Company and manager of the Waterbury, Conn., branch of the concern, died at his home in Waterbury on October 1, 1929. He was born in Ridgefield, Conn., and was educated there and in New York city. He entered the First National Bank at Norwalk, Conn., as a clerk and later entered a firm of wholesale grocers in New York City, where he stayed for nine years. In 1879 he went to Meriden to be auditor and accountant of the Meriden Britannia Company and later became secretary and director, offices which he continued to hold with its successor, the International Silver Company. He was also treasurer of the Rogers Brothers Silver Company of Waterbury and a director of the Manning and Bowman Company and the Miller Brothers

Charles L. Rockwell were also prominent in the International Silver Company. He went to Waterbury in 1898 to manage the local branch there.

Mr. Rockwell was married in 1881 to Miss Minnie Battles of Lowell, Conn. He is survived by two sons, Sherburne B. Rockwell of Waterbury, and George Rockwell, Jr., of Fanwood, N. J.

—W. R. B.

Claude V. Marks

Claude V. Marks, secretary, treasurer and director of the Ohio Brass Company, Mansfield and Barberton, Ohio, and Niagara Falls, Ont., is believed to have been drowned while en route to Europe on the steamship *Homer* with C. C. King, president of the company. On September 9, Mr. Marks disappeared and officials of the steamship company, after a futile investigation, concluded that he had accidentally fallen overboard. Besides his connection with the Ohio Brass Company, Mr. Marks was also secretary, treasurer and a director of the Ohio Insulator Company, Mansfield, and the Canadian Ohio Brass Company, Ltd., Niagara Falls, Ont.

Hiram M. Davis

Hiram M. Davis, veteran electroplater of Milwaukee, Wis., died at his home there September 10, 1929. Mr. Davis was 77 years old. In 1875 he established a plating shop in Milwaukee, one of the first in that city, and very early in the history of the process itself.

News of the Industry

Industrial and Financial Events

Brass Ingot Statistics

Non-Ferrous Ingot Metal Institute, Chicago, Ill., reports the average prices per pound received by its membership on commercial grades of the six principal mixtures of ingot brass during the twenty-eight day period ending October 11th.

In the table the prices for the October period are shown in comparison with those for the corresponding September period:

	September	October
Commercial 80-10-10 (1% impurities).....	16.974c	17.31c
Commercial 78%	15.161c	15.25c
Commercial 81%	15.313c	15.574c
Commercial 83%	15.734c	15.827c
Commercial 85-5-5-5	15.972c	16.086c
Commercial No. 1 yellow brass ingot.....	15.826c	12.861c

On October 1st, unfilled orders for brass and bronze ingots and billets on the books of the members of the Institute amounted to a total of 16,246 net tons.

The combined deliveries of brass and bronze ingots and billets by the members for the month of September, 1929, amounted to a total of 7,944 tons.

General Electric Company Orders

Orders received by the General Electric Company, Schenectady, N. Y., for the three months ended September 30th amounted to \$116,688,014, compared with \$90,328,666 for the corresponding quarter of 1928, an increase of 29 per cent, President Gerard Swope has announced.

For the nine months ended September 30th orders received amounted to \$337,404,470, compared with \$260,686,463 for the first nine months of last year, also an increase of 29 per cent.

Samson-United Corporation

The Samson-United Corporation, which recently absorbed the business of the Samson Cutlery Company, has just purchased one of the largest plants in Rochester, N. Y. The plant was formerly occupied by the Selden Truck Company. The building is approximately one-quarter of a mile long, covering an area of about six and one-half acres, with a floor space of 200,000 square feet. The new plant will be equipped with the most modern, labor-saving equipment for straight line production and will employ over 500 people on their line of electrical appliances, stainless steel, cutlery and stainless steel kitchen tools. The plant is being prepared for immediate occupancy.

National Business Show

The twenty-sixth annual National Business Show was held at Grand Central Palace, New York City, October 21 to 26. Displays of every conceivable device for office and plant control were shown, with an overwhelming number made of metal, both ferrous and non-ferrous, and finished in everything from paint to chromium plate. Of considerable interest from the metal man's viewpoint was the startling array of aluminum furniture shown by the Aluminum Company of America. This included desks, chairs, clothes trees, waste baskets, and many another article for office furnishing.

Republic Brass Corporation Changes Name

Republic Brass Corporation, New York, has changed its name to Revere Copper and Brass, Inc., effective November 12. The action was taken in order to perpetuate the name of Paul Revere, who founded one of the companies merged to form the corporation. Further particulars will appear in a later issue.

Antimony Tariff Discussed

The National Battery Manufacturers Association opened its annual convention October 24 at the Hotel Hollenden, Cleveland, Ohio. The chief discussion of the first day's session was on the proposed antimony tariff which is included in the bill being debated by the United States Senate. In a paper entitled "The Proposed Tariff on Antimony," by S. A. Trench of the American Metal Market, New York City, it was pointed out that the proposal is to make the antimony duty adjustable to the price, sliding from 4c. per pound when the New York antimony price is not over 7c. per pound down to ½c. when antimony is 14c. and no tariff when it is over 14c. The writer contended that the duty was unnecessary as there is no producing antimony industry in this country requiring protection. He suggested that the increased tariff (the present duty is 2c. per pound) was desired by interests who wish to build a plant in the United States to smelt Mexican ore which would be brought in duty-free, there being no duty on ore, and none proposed. He urged the battery makers, as consumers, to oppose the measure on the ground that it is contrary to the interests of consumers of antimony and beneficial only to one concern, which, he emphatically pointed out, is controlled by British interests.

Generator Manufacturers in Merger

The Eager Electric Company, generator manufacturers, for 28 years located at Watertown, N. Y., has joined with The Electric Products Company, Cleveland, Ohio, and will discontinue operations at Watertown. Manufacturing will be concentrated at a new plant under construction at Cleveland, to be operated under the name of The Electric Products Company. The executive and engineering staffs of both concerns will be merged to form an unusually strong organization for service to the electroplating industry. Both "Eager" and "E-P" products will be made.

Lasalco, Inc., Expansion

Lasalco, Inc., of St. Louis, Mo., have recently extended their manufacturing space, the new addition doubling their facilities. The extension was necessitated by a general business growth and particularly by the need of more floor space for the manufacture of plating and burnishing barrels. The address, which was formerly 2828-38, is now 2822-38 LaSalle Street, St. Louis.

Bohn Aluminum and Brass Company

Bohn Aluminum and Brass Company, Detroit, Mich., reports for the first nine months of 1929 net profits of \$2,474,906 as compared with \$2,472,087 for the corresponding 1928 period. Sales for the period totaled \$29,000,818 this year against \$25,593,471 in the 1928 nine months.

Immense Bronze Casting

The Roman Bronze Works, Corona, Queens, New York City, recently turned out what is claimed to be the largest bronze casting of its kind ever produced in the United States, according to Henry Hering, 10 West 33rd Street, New York City, who designed it. Mr. Hering stated that the statue was cast as part of a \$4,000,000 War Memorial now nearing completion at Indianapolis, Indiana.

New Electrolytic Zinc Plant Opens

Announcement is made by the Evans-Wallower Lead Company of the successful starting of its electrolytic zinc plant at East St. Louis, Illinois. The roasters were started early in September and power was switched on the cellroom on September 23. Output of cathode zinc at the beginning was twenty-five tons per day, and has now been increased to the rated capacity of fifty tons daily.

No difficulties of any kind were experienced in the functioning of the Tainton process, and, it is stated. The melting furnace was placed in operation and slabs carrying the trade name "Evanwall" were cast in preparation for shipment. All metal produced has assayed in excess of 99.99% purity. The plant is operated by the Evans-Wallover Zinc Co., a subsidiary of Evans-Wallover Lead Company.

The Evans-Wallover Lead Company has announced the erection of an electrolytic lead plant on the same location, which will be started about December 1. This plant will recover lead values from the residues of the zinc plant and will make a product which will be suitable for conversion into litharge and red lead in the Charleston plant of the company.

Electrical Show

The National Electric Exposition at Grand Central Palace, New York City, October 7 to 12, was similar to the radio show in its relation to the metal and finishing industries. There were hundreds of examples of the increasing use of non-ferrous metals in electrical production, and also very many applications of practically every finish known, from sprayed paint to chromium and cadmium plate. Naturally, the more common finishes predominated. Such finishes as nickel and copper plate, bronze effects, and many

sprayed and lacquered surfaces abounded. Very notable was the display of Manning-Bowman and Company, Meriden, Conn., who showed chromium plated table-ware of various kinds, electrified and otherwise. There were other displays that attracted the eye by their use of chromium.

New Companies

Easton Chromium Plating, Inc., 685 Northampton Street, Easton, Pa.; organized to operate chromium, cadmium, copper, nickel, silver and brass plating and polishing plant. Company reports it is equipped to do this work on production basis.

Union Metals Company, Inc., Linden, N. J.; 2,500 shares common stock; metal products; correspondent, Victor H. Eichorn, Rahway, N. J. The company will handle scrap metals, operate auto wrecking and cutting up departments.

Hypes and Gropp Manufacturing Company, Inc., Indianapolis, Ind.; chartered with capital stock of 250 shares having total par value of \$100,000; to manufacture metal spinings and specialties. The company was formed about 5 years ago as a partnership of **Joseph Hypes** and **Herman Gropp**, now occupies 15,000 sq. ft. of floor space. All departments are working overtime, with plenty of orders on books, Mr. Hypes reports. Spinning, stamping, plating, polishing, lacquering, tool, spot welding and assembly departments are operated.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

NOVEMBER 1, 1929

George A. Goss, vice-president and superintendent of manufactures of the **Scovill Manufacturing Company**, has resigned his position as superintendent on account of his health. He continues, however, as vice-president and a director of the company. **Captain Albert Luscher** has been appointed to succeed Mr. Goss as superintendent of the manufacturing departments. Mr. Goss is a brother of **E. O. Goss**, president of the company, and of **John H. Goss**, first vice-president and general superintendent.

Work has been started on a large addition to the Scovill wire and rolling mill plant at Silver Street and Hamilton Avenue. The structure will cost about \$50,000, will be one story high and of steel and concrete. The height will be 36 feet and the frontage on Silver street will be 386 feet with a depth of 23 feet while the Hamilton Avenue frontage will be 391 feet and the depth, 63 feet.

The **Chase Brass and Copper Company** has acquired four additional warehouses, in Milwaukee, Buffalo, Seattle and Oakland. This makes 19 such warehouses it owns throughout the country.

Moses C. Spier, formerly superintendent of the **American Pin Company**, has retired from his connection with the plumbers brass goods division of the Scovill Company after continuous service with the two concerns for 44 years. For the last six years, since the pin company was taken over by Scovill, he has been engaged in executive office work. He is now in his 66th year. A farewell dinner was given him on his retirement at which **W. W. Bowers**, assistant secretary and sales manager of the plumbers' brass goods division, presented him with a gift from the employees. He has been succeeded by **P. H. Robinson** as superintendent.

John A. Coe, president of the **American Brass Company**, and **Frederick S. Chase**, president of the **Chase Companies, Inc.**, were elected to the executive committee of the **Copper and Brass Research Association** at its annual meeting in New York last month.

F. S. Chase has been appointed to the committee on commercial arbitration of the **Connecticut Chamber of Commerce**, which is to establish a permanent arbitration tribunal under provision of an act passed by the last General Assembly.

W. A. Knox was elected president of the Foremen's Association of the plumbers' brass goods division of the **Scovill Manufacturing Company** at the annual meeting last month. Other officers elected are: Vice-president, **G. Goggins**; secretary, **T. D. Doyle**; treasurer, **J. M. Lynch**; directors, **R. Frank**, **W. Benham**, **J. Duncan**, **P. Donahue**, **E. Eureka**, **M. Hawley** and **J. McArdle**; entertainment committee, **R. L. Bates**, **G. Callahan**, **J. Platt**, **S. Mitchell** and **W. A. Knox**.

Robert A. Waters was elected president of the **Chase Foremen's Association** at the annual meeting last month. The other officers elected are: Vice-president, **C. Russell Kirsch**; treasurer, **Walter Jaeger**; secretary, **Leo Conway**. **Richard D. Ely**, treasurer of the company, made a short address.

Statistics on the button rates used by the **Scovill Manufacturing Company** at hearings before the Ways and Means Committee of Congress on the tariff bill were involved in the testimony of **Charles Eyanson** before the Congressional Committee investigating charges of lobbying last month. **Congressman Tydings** of Maryland, attacking the employment of Mr. Eyanson by **Senator Hiram Bingham** of this state, cited the Scovill Company as one of the Connecticut concerns that has prospered greatly in recent years and stood to receive greater protection under the rates in the proposed new tariff bill. He also cited the **Waterbury Clock Company** in the same connection. **Senator Ramsdell** of Louisiana has requested the Treasury Department for tax information upon the returns of the **Waterbury Clock Company** and other clock concerns.

Patents were granted local inventors during the month as follows: **D. L. Summey**, engineer of the **Scovill Manufacturing Company**, assignor to that concern, two on heating furnace and electric furnace; **George P. Anderson**, assignor to Scovill, lip stick container; **Paul E. Fenton**, assignor to Scovill, resilient snap-fastener; **Otho Duryea**, car construction.—W. R. B.

Bridgeport, Connecticut

NOVEMBER 1, 1929

The largest number of workers employed in Bridgeport factories for the past three years was recorded for the week ending October 5, according to the **Manufacturers Association** survey of 31 representative factories, which showed 13,297 workers and a total of 652,834 hours put in during the week.

The number of workers is 2,000 over the low mark of July, 1928, and the hours worked is 100,000 over the low mark of that period. The average weekly industrial payroll for September was \$1,159,497, or 12 per cent higher than for the corresponding month last year. The average weekly payroll for 1929 has been from 5 to 15 per cent above last year.

Outside of Boston and Lynn, Bridgeport manufactures more electrical goods than any other city in New England, **Senator A. E. Lavery** declared at the Edison celebration last month.

The **Fletcher-Thompson Company** has been given the contract for the construction of an addition to the factory of the **Hoffman Bearings Corporation** on Hamilton Street. The addition will be 100 by 200 feet, of brick and steel construction, two stories high.

A tour of the **General Electric Company's** plant was made by 500 members of the **Manufacturers' Association of Connecticut** at their meeting here last month. The association's business sessions were held at the **Remington Arms plant**. **E. W. Christ**, vice-president of the **Stanley Works**, New Britain, and **C. E. Morris** of the **Wallace Silver Company**, Wallingford, were added to the board of directors.

Leading officials of the **General Electric Company**, including **President Gerard Swope**, were guests of the local **General Electric plant** last month. **C. E. Patterson**, vice-president, acted as host. A three-hour business meeting was held in the morning, followed by luncheon and an inspection of the plant. **E. Wilbur Rice**, honorary chairman of the board, and **Clark H. Minor**, president of the **International General Electric Company** were present.

Damage estimated at \$2,000 was caused at the former plant of the **Bridgeport Metal Goods Company**, now owned by the **Hotchkiss Company**, at Harbor and Carbon Streets, when a fire broke out there from an unknown cause last month.

W. B. Webster, vice-president of the **Bridgeport Brass Company**, was elected a director of the **Copper and Brass Research Association** at its annual meeting in New York last month.

Among patents granted local inventors during the month were the following: **Edward Conner**, assignor to the **American Cable Company**, wire rope and method for making same; **Edwin Perkins**, assignor to the **Hoffman Bearings Corporation**, spinning spindle. A trade mark was granted the **Bead Chain Manufacturing Company** for metal chains, pull-socket chains, plumbing chains and key chains. —W. R. B.

Connecticut Notes

NOVEMBER 1, 1929

NEW BRITAIN—**Joseph Lamb**, plant superintendent, expressed the opposition of **Landers, Frary and Clark** to a proposal made at a zoning board meeting last month to change property near the company's plant on High street from a residential to a business zone. **Chairman C. F. Smith** of the board of directors, through an attorney, also opposed the proposed change.

STAMFORD—The **Yale and Towne Manufacturing Company** has negotiated for the purchase of the **H. and T. Vaughn Company, Ltd.**, of Willenhall, England. Stockholders of the latter company have voted to ratify the proposed sale. Exchange of 19,400 shares of Yale and Towne stock for shares in the English company is proposed. With this acquisition the local concern will have plants in England and Czechoslovakia, two in Germany and six in the United States and Canada.

Walter C. Allen, president of the **Yale and Towne Manufacturing Company**, has been elected a director of the **Western Electric Company**.

BRISTOL—Directors of **Veeder-Root, Inc.**, have declared the regular quarterly dividend of 63 cents a share payable November 15 to stock of record October 31. The business period just ended was the largest on record and sales this year have run 22 per cent higher than a year ago.

Temple and Crane, Inc., have been given the contract for the construction of five sub-stations in this city for the **New Departure Manufacturing Company**. They will be one- and two-story, of concrete and brick.

The **E. Ingraham Company** has announced the adoption of a group insurance program for the benefit of its more than 1,500 employees. It will become effective this month and provides the employees with approximately \$1,500,000 life insurance.

MIDDLETOWN—The directors of the **Russell Manufacturing Company** have declared the regular quarterly dividend of \$1.50 a share, payable November 15 to stock record November 9. The reports presented at the meeting showed that earnings are improving. The directors deferred action on the proposed capital increase until the next meeting.—W. R. B.

Middle Atlantic States

Newark, N. J.

NOVEMBER 1, 1929

Several metal fabricating firms have made changes here during the past month. The **Inca Manufacturing Corporation** of Fort Wayne, Ind., makers of copper wire products, will establish general eastern headquarters in the Industrial Office Building. It will be in charge of **P. E. Stouffer**. **Amsterdam Brothers**, manufacturers of surgical instruments, has leased a part of the same building.

The **Accurate Engineering and Manufacturing Company**, makers of radio parts, has leased part of the plant at 102 Murray Street. The radio part makers will use the company for a subsidiary company.

The **Kirchhoff Patent Company** has moved from 60-64 Union Street, which it occupied for half a century, to 30-32 Stirling Street. The company manufactures metal toys and novelties. The concern was founded in 1852. The new factory, controlled by **C. H. Dietze**, replaces the structure of the **Nonpareil Toy Company**, which burned down a year ago.

The **Beaver Manufacturing Company**, 625-45 North Third Street, makers of electrical specialties in wiring devices, is now occupying a two story brick building in the rear of the old plant. This gives the company many thousand more feet of floor space. Final assembly work, warehousing of finished products and shipping of goods will take place in the new building. **Ernest B. Slade** is president and general manager

of the company; **Harold E. Slade**, vice-president and secretary; and **Louis Isele**, general superintendent. Products of the firm are used in the United States and nearly every foreign country.

The **Globe Machine and Tool Company, Inc.**, Newark, has been incorporated with \$125,000 capital to manufacture mill supplies. The **Chameleon Novelties Corporation**, of Jersey City, has been chartered with \$100,000 capital to manufacture fountain pens.

—C. A. L.

Trenton, N. J.

NOVEMBER 1, 1929

The **Federated Metals Corporation**, with plants at Trenton, has been partially successful in securing relief from alleged unreasonable spelter freight rates. While the rates were found by the Interstate Commerce Commission not to be unreasonable or discriminatory, they are declared to be prejudicial to the corporation and preferential of competing concerns located at Palmerton, Pa. The undue prejudice was ordered removed. The disputed rates on spelter are from Trenton to destinations in Pennsylvania, Ohio, Indiana, Illinois, Michigan, Virginia, West Virginia, Kentucky and Tennessee. The Commission reduced the rates to a level with those applying on shipments from Palmerton, Pa., to the same destinations.

Robert C. Roebing, an official of **John A. Roebing's Sons**

Company, has appealed to the United States Board of Tax Appeals from an alleged deficiency in his income tax return for 1925 amounting to \$9,500.62, as assessed by the Commissioner of Internal Revenue, who claims he has made an overpayment of \$3,049.25 for 1925 and is entitled to a refund. A refund of \$62,084 to the estate of the late Charles G. Roebeling has been announced by the Bureau of Internal Revenue. The over assessment of the estate was caused by the allowance of reduction for inheritance taxes paid in behalf of the estate to New Jersey. The fight to obtain a reduction had been carried on for several years by the children of the deceased.

An action to recover on contract to the amount of \$60,000 has been begun before Judge William N. Runyon in the United States District Court here by the **Keystone Watch Case Corporation**, Riverside, N. J., against the **Motor Requirement Corporation**, Newark. It is the contention of the plaintiff that the defendant failed to carry out its part of the contract to purchase 106,000 gasoline filters for use on automobiles at \$1.06 each, which the latter had ordered manufactured at the watch case factory. In accordance with the contract, according to the Keystone Corporation, 37,000 of the appliances had been manufactured when the Motor Requirements Corporation failed to fulfill its agreement to pay \$50,000 on account. The

latter's defense is that the watch case concern did not manufacture the device in accordance with specifications, which made the filter unmarketable. Testimony in the case will be heard this month.

William G. Wherry, president of the **Skillman Hardware Manufacturing Company**, Trenton, was sued for \$230,000 in the Middlesex Circuit Court at New Brunswick, as a result of an automobile accident. Wherry's car crashed into another machine on the Brunswick Pike. The jury awarded a verdict of \$35,000.

The United States Labor Department reports that labor in New Jersey continued on a high level throughout the month of September. Slight recessions were noted only in Trenton, Passaic and Atlantic City.

The following concerns have been incorporated here: **Nite-Glow Chemical Company**, Camden, \$10,000; manufacture chemicals. **Kleinfeld and Scholz**; \$250,000; manufacture enameled ware; Passaic, N. J. **Anome Electric Company**; \$100,000 preferred and 5,000 shares common; manufacture electrical devices; Jersey City. **Camden Iron and Metal Company**; 1,000 shares no par; Camden. **Standard Screen and Weather Strip**; \$25,000; manufacture screens; Jersey City. **Summit Pen Company**; \$50,000; manufacture pens; Jersey City.

—C. A. L.

Middle Western States

Detroit, Michigan

NOVEMBER 1, 1929

Production has declined in the non-ferrous metal industries for the last four weeks or more. It is due largely to the decline in motor car output. It is the usual seasonal condition and was expected. However, there is considerable comment as to what the next few months have to offer for every line of industry. It is generally thought that present conditions will prevail until January, as has been the case in past years.

There may be some changes out of the ordinary in the motor car industry. Competition is becoming so highly competition that no one can forecast very reliably just what is in store for the middle west and particularly for the Great Lakes Cities, and what will have to be faced after the first of the year. One thing is sure—there is going to be a great scramble for business. Whether there will be enough to give a comfortable feeling to every one remains to be seen.

A new \$300,000 foundry and 24,000 square foot addition to the factory of the **Federal-Mogul Corporation**, manufacturers of bearings, bushings and allied products, have been completed and are now in full operation. In addition to providing for constant development of bronze alloys and babbitt metals, this modernized step facilitates materially the handling of work in a direct route through all operations, from the foundry to the shipping department. The foundry is of brick and steel construction and occupies a ground area of 39,600 square feet. Ventilation and light have been considered carefully because of discomforts usually attending the handling of hot metals. It houses the babbitt manufacturing department, bronze melting and moulding units, chemical and physical laboratories, and the pattern and core departments.

A new brass foundry and core room will be erected by the **United Brass and Aluminum Manufacturing Company** at Port Huron, to replace the buildings damaged by fire on September 9, it is announced.

The name of **Baldwin Abrasives, Inc.**, Pontiac, Mich., has been changed to **Baldwin Abrasive Company**.

The **Lockheed Division** of the **Detroit Aircraft Corporation** reports net sales of \$383,193 for the period from June 1 to August 30, according to **E. S. Evans**, president of the parent organization. These sales include seven planes in June, five in July and 13 in August, a total of 25.

A new connecting rod for motor cars made from Bohnalite is to be placed on the market by the **Bohn Aluminum and Brass Corporation**. The new rod, it is stated, will reduce the weight of this piece of equipment two thirds. Production, in a new

plant, is scheduled to start about December 1. A new building, 110 by 150 feet in area and three stories high, adding 50,000 square feet to the company's floor space, is to be erected for this work.

Alemite Lubricator Company of Michigan has recently changed its name to **Alemite Company of Michigan**.

Stinson Aircraft Corporation, it is announced, has made an expenditure of approximately \$200,000 this year on construction and expansion of its plant at Wayne. One of the largest new buildings is 180 by 360 feet, of steel and reinforced concrete construction. The 85,000 square feet of floor area are particularly adapted to airplane manufacture.

Commonwealth Brass Corporation is said to have the largest battery of automatics in this district devoted to the fabrication of brass rod. The company produces radiator valves, automotive fittings and brass forgings. It is now in its 18th year and has enjoyed a phenomenal growth. It employs at present upwards of 300 persons.

Next to the sale of coke, the largest single item in revenue producing by-products in the plants of the **Ford Motor Company** is scrap metal, and this, of course, includes brass, copper and aluminum. Daily an average of 28 freight cars pull out of the plants loaded with scrap of various kinds.

It is expected that more than 7,000 visitors will be in Detroit during the annual convention of the **National Standard Parts Association**, in November. One of the features will be a display of automotive parts and equipment covering 100,000 square feet of floor space and with nearly 300 individual exhibits. Among the prominent Detroit members of the association are the **Clayton and Lambert Manufacturing Company**, the **McCord Radiator and Manufacturing Company** and the **Puritan Auto Parts Company**.

—F. J. H.

Toledo, Ohio

NOVEMBER 1, 1929

Fall manufacturing is slowing up to some extent in this area, particularly as concerns the non-ferrous field. This is only seasonal, however, and had been generally expected. But no one knows how long it is going to last. Usually there is a low level of production until after the first of the year, or until after the annual motor car shows. This is very likely to be the trend of things, for there is nothing to indicate a change to the contrary. Accessory manufacturers have had an exceedingly busy summer and prospects for the future are just as encouraging as they were a year ago.

Plating plants also have been active for a long time and still

are busy. Toledo has so many diversified plants which operate plating departments that the plating industry is not greatly affected by seasonal conditions.

Manufacturers in general are anticipating more favorable business conditions directly after the first of the year.

The generosity, friendliness and open-mindedness of the late **Thomas A. DeVilbiss**, Toledo spray manufacturer, were expressed recently at the dedication of the **DeVilbiss Memorial Bridge** near Toledo. Members of his immediate family were present.

Linwood A. Miller, who succeeds **John N. Willys** as president of the **Willys Overland Company**, has for the past four years served as first vice-president of that organization and has been an executive of the company for the past fifteen years. He is recognized as an official of force, experience and foresight and is exceedingly popular throughout the organization.

—F. J. H.

Cleveland, Ohio

NOVEMBER 1, 1929

Manufacturing seems to have hit its usual late fall level with a curtailment of production. It does not give much concern, for the well-informed realize it is only temporary. It is quite probable productions schedules will continue on a reduced basis for several weeks. Much, however, depends on the motor car and airplane industries. After the fall decline, motor car manufacturing does not get underway with any vigor until after the first of the year. At present it looks as if there would be no change in the general order of things.

The airplane industry has made decided strides during the summer and fall. Prospects are that it will continue that way indefinitely. Each month reports are made of increased production. The coming winter no doubt will witness further increased activity along this line.

The plating industry has been making more than usual progress. Most of the plants have been busy for a long time. While conditions may not be quite so brisk as they were a few weeks ago, the outlook is promising nevertheless.

The Thomas J. Corcoran Lamp Company, Cincinnati, has, it is announced, obtained a contract from the **Chrysler Corporation** to supply the 1930 lamp requirements of the Dodge, Plymouth, Fargo and DeSoto lines.

Robert W. Woodruff has been elected president of the **White Motor Company**, Cleveland, and its subsidiaries, succeeding the late **Walter C. White**. Mr. Woodruff had been a director of the White organization and a member of its executive committee for a number of years. Other newly elected officers are **Saunders Jones**, vice-president and assistant to the president; **George H. Kelly**, vice-president and treasurer; **H. D. Church**, vice-president in charge of engineering; and **George W. Smith, Jr.**, vice-president in charge of production.

The Briggs Manufacturing Company, it is announced, has leased additional land and buildings adjoining its present plant in Cleveland. The buildings leased formerly were occupied by the **Walker Motor Company**. The Briggs Company, it is reported, has secured some business from the **Ford Motor Company**, which heretofore had been supplied by another body-making concern.

—F. J. H.

Wisconsin Notes

NOVEMBER 1, 1929

Badger Sheet Metal and Furnace Works, Inc., Milwaukee, was recently incorporated with 50 shares at \$100 each. The company will operate a general sheet metal and furnace works. The incorporators are **A. Ansfield**, **V. E. Wilson**, and **E. Dose**.

After cutting burglar alarm wires, intruders entered the **Badger Brass foundry**, Milwaukee, and escaped with \$210 worth of brass and copper.

Fire of an unknown origin destroyed the office equipment and ruined the roof and interior of the **Beloit Iron and Metal Company**, building at 160 Mill Street, Beloit. Approximately \$15,000 damage was done, according to company officials.

Charles B. Salmon, 79, the co-founder of the firm from which which grew the **Fairbanks-Morse Company**, died recently at Beloit.

—A. P. N.

Other Countries

Birmingham, England

OCTOBER 21, 1929

The Birmingham Jewelers and Silversmiths Association is arranging for a composite stand at the London Section of the **British Industries Fair**, to be held next February at Olympia. The space has already been booked and visitors will have the opportunity of seeing the various products of the jewelers art in silver, gold and enamel, all of which is made in the Birmingham jewelry quarter. Last year over 100 manufacturing jewelers participated in the composite stand and it is hoped that this number will be enlarged and that there will be a better individual representation of the trade than last year. The industry has passed through a very severe testing time since the war, but the improvement noticeable in the last two or three years is being maintained and activity is more pronounced throughout the trade. One of the difficulties is the dearth of skilled labor. The jeweler's art is not learned in a day, and in the slump years many employees were obliged to give up their calling and seek a living elsewhere. The wireless trade, in which a number of delicate operations are entailed, provided a good deal of employment for those who had to leave the jewelry industry, while the rapid increase in automobile production has taken some labor in a similar way. The trade runs a Jewelers' School with day and evening classes in which students are trained for the various sides of the industry and this, no doubt, is a great help in filling vacancies. Preparations for the Christmas season are well in hand.

The Birmingham Guild, Ltd., specialists in art metal work, have just received a contract for the making of a shrine to contain the "Golden Book" of subscribers' names in the new Cathedral of St. John the Divine, New York. The Guild will work to the design of **Cram and Ferguson**, a firm of Boston,

Mass., architects. The shrine will be in the Gothic style, 13 feet 6 inches high, 6 feet wide, and 3 feet deep, with a pedestal of Belgian black marble panelled in bleu Belge marble. The superstructure in the form of delicate tracery panelling between mullins, the latter terminating in graceful arches, will be carried out in solid bronze which will be chased and heavily gold plated both inside and out. In the spandril pieces formed by the arches and the shrine there will be 16 shields modelled in relief and bearing various emblems, the whole terminated and covered with a hipped roof with pinnacles and cresting. The work will take six months to complete. Within this elaborate shrine is to rest a book in which will be inscribed the names of all the donors to the new cathedral, which has been built by public subscription. It is intended to illuminate the book by reflected lighting from the interior of the roof.

Dr. Percy Longmuir, well known in England as a great metallurgical authority and a recognized expert in cast iron, was recently honored by the workers engaged in the Sheffield steel melting and foundry trades with the "Freedom" of those industries. **Sir Henry Hadow**, vice-chancellor of Sheffield University, conferring the distinction, handed Dr. Longmuir a case containing a handsome silver medallion specially designed by the **Sheffield Silver Trade Technical Society**.

Brassfounders in the district are busy on various kinds of fittings in connection with lighting, in anticipation of the renewals that are always made at this season of the year. The gas and electric supply departments are unusually busy and the fact that housing schemes are being vigorously pursued in various parts of the country call for all descriptions of metal fittings in brass, copper, bronze, and many kinds of finish, such as stainless and chromium plating, which have recently become popular.

The chromium plating industry is making steady progress. At the Motor Show to be held shortly most of the more ex-

pensive models will include this new finish on radiators, lamps, door handles and all external fittings.

Smith and Davis, Ltd., brassfounders, Hampton Street, Birmingham, are making arrangements for considerable enlargement of their premises. The firm carries on a big business in repetition work in sheet metals, brass work for the building, plumbing, gasfitting, cabinet and other trades, and

the accommodation of the present building is inadequate for efficient working. The firm has been fortunate in securing a piece of land adjacent to the present works, which are situated quite near to the centre of the city, and the area of the new site is $1\frac{1}{2}$ times as large as that covered by the present works. The land will shortly be prepared for building but so far no contract has been placed.

—J. A. H.

Business Items—Verified

Pease and Curren, 104 Point Street, Providence, R. I., operating a fine metals refining plant, have awarded a general contract for one-story addition, 55 x 100 ft., to cost about \$30,000.

The Modern Plating Works, Chicago, Ill., has taken new quarters at 3029-31 North Rockwell Street. The company operates a plant for chromium, copper and nickel plating, polishing, buffing, etc.

St. Louis Motor Valve Company, St. Louis, Mo., has established a sales office in New York City to facilitate handling of eastern business. For the present the office is located at 246 Fifth Avenue, and is in charge of **Arthur B. Schellenberg**.

Air Industries Foundry, Wichita, Kansas, recently organized, has removed to a new building at 701 East Ninth Street. The company manufactures special castings for aircraft construction. **Lloyd Stearman** is president and **K. M. Roth** is general manager.

The Trico Fuse Manufacturing Company, Milwaukee, Wis., makers of "Trico" fuses and fuse pullers, have found it necessary to move their Chicago office to 549 West Washington Boulevard, Room 614, Chicago, Illinois, where larger quarters are available.

The Cleveland Hardware Company, Cleveland, Ohio, has installed a die casting department at its Lakeside Avenue plant. This department is under the direction of **Albert R. Keane**, division manager. The company plans to develop this end of its business gradually.

Norge Corporation, a division of **Borg-Warner Corporation**, has acquired new manufacturing facilities. The company has taken over the Detroit plants of the **Morse Chain Company**, also a Borg-Warner subsidiary. The Norge company manufactures electric refrigerators.

Wilson and Nutwell, 140 Callish street, Fresno, Calif., bronze, aluminum, iron and steel castings, reports business good. That company took over the foundry of the **Lisenby Manufacturing Company**, Fresno, Calif., about a year ago and since that time has added a pattern shop to the plant.

Multiplex Faucet Company, 4325 Duncan Avenue, St. Louis, Mo., has awarded contract for one-story top addition to plant, 80 x 160 ft., to cost about \$30,000 with equipment. The company operates brass machine shops, tool room, stamping, zincing, tinning, brazing, plating and polishing departments.

M. E. Baker Company, 83 Haverhill Street, Boston, Mass., has entered into the plating and polishing supply business, handling a general line of supplies as well as new and used equipment. The company was formed by **M. E. Baker**, formerly president of the Boston Plating Supply Company, Inc.

The U. S. Stoneware Company, New York City, has just purchased a 5-acre site adjoining its Plant No. 3, at Tallmadge, Ohio. This will provide for future expansion. The company was founded in 1865 and now operates three plants for the manufacture of acid-proof chemical stoneware. **Frank S. Willis** is president and **Howard Farkas** is sales manager.

Lester A. Hicks has opened a brass foundry and builders hardware factory at 1736 Standard avenue, Glendale, Calif., under the name of **L. A. Hicks Manufacturing Company**. Mr. Hicks formerly was president and general manager of the Pacific Brass and Hardware Manufacturing Company. The company operates a non-ferrous foundry, plating plant, machine shop, etc.

Wagner Electric Corporation, St. Louis, Mo., announces the removal of two branch sales offices. The Milwaukee sales

office and service station has been moved from 501 Broadway to 525-27 Broadway. The St. Louis sales office has been removed from 505 Shell Building to 909-9 Plaza Olive Building. Those removals were necessitated by increased business requiring more space.

Pittsburgh Metal Airplane Company, Pittsburgh, Pa., was organized a few months ago by officials of Pittsburgh Aviation Industries Corporation, and is now occupying part of former plant of American Car Company. Company recently acquired **Thaden Metal Aircraft Company**, San Francisco, which has been removed to Pittsburgh, where production will be concentrated. **H. V. Thaden** is chief engineer.

Indianapolis Machinery and Supply Company, Inc., Indianapolis, Ind., has removed to new quarters at 1959-69 South Meridian Street, where space ample for the company's enlarged business has been provided. The company has a complete rebuilding plant and a larger force of mechanics as well as larger stock facilities for its line of rebuilt machine tools. The company has in all 83,000 sq. ft. in a 3-story brick building adjoining railroad.

Paasche Airbrush Company, Chicago, Ill., has taken larger and more modern quarters for their New York sales and service branch, now located at 103 Lafayette Street, New York City. **L. J. Dagon** continues as branch manager, assisted by **H. A. Schwarz**, **Louis Straub**, **P. R. Ford**, and **G. M. Theuret**. The branch serves Paasche customers in Connecticut, Rhode Island, New Jersey and New York. A complete stock of equipment will be constantly maintained at this new address.

J. Schrader Company, 418 High Avenue, Cleveland, Ohio, metal spinners and general metal products manufacturers, have increased their facilities for production of spinnings, etc. The company is equipped to do spinning work in any size up to 44 in. diameter in brass, copper, steel, aluminum, Monel metal, etc. Manufacturers' jobbing contracts in any quantity are handled. The company numbers among its customers some of the largest corporations in the United States and Canada, according to **J. Schrader**, president. Experimental work is one of the firm's specialties.

The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland, Ohio, has placed a contract for a new factory and office building to adjoin the present plant. Construction will start at once, according to **Franklin G. Smith**, president and general manager. The new building will increase the company's production and office space about twenty-five per cent. The two divisions of the company will benefit by the expansion program. The brush division is said to be one of the largest producers of brushes for industrial uses. The machine division designs and manufactures molding machines, sand treating and sand and mold conveying equipment used in foundries.

Autosan Machine Division of Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn., announces the appointment of **A. T. Nogrady** as Autosan representative for New York, covering New York City, parts of New York State, and the Philadelphia, Baltimore and Washington districts. The Autosan division, managed by **G. R. Porter**, manufactures "Autosan" dish, silver and metal parts cleaning machines. Mr. Nogrady is stated to be well experienced in the cleaning field. He will be associated with **Russell Chico** and both will make their headquarters at 20 Vesey Street, New York. The company reports business prospects are very fine. An installation of note recently was made at the new Western Union Building in New York, where three conveyor type "Autosan" machines were placed.

Review of the Wrought Metal Business

By J. J. WHITEHEAD

President of the Whitehead Metal Products Co. of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

NOVEMBER 1, 1929.

The falling off in the building business became more pronounced during October and may be attributed mainly to high money rates. Quite a little unemployment prevails in the building trades, especially in the East. Automobile production has fallen off. It is understood, however, that some manufacturers of cars are changing their models and this shutdown, reflected in the production figures, makes the situation look worse than it probably is. The recent securities panic probably was the final blow to a period of excessive speculation and probably from now on reasonable money rates will result in financing and investment in industry, building and other lines using metals and other materials.

The business situation, as discussed by industrial leaders, indicates that we may look forward with renewed confidence. It is expected that building as well as the automobile industry will have a revival.

The copper situation, especially exports, during the past month has been very quiet. This, however, is not so bad an omen as might be supposed. It should be remembered that a very violent buying movement took place recently. It is more than likely that another buying movement is just ahead. A situation similar to

that prevailing in the export market is noted in this country.

The copper wire business is still very good and, as stated last issue, it is hard to obtain certain sizes of wire. The demand for other fabricated products has eased a little along with the slight curtailment of business.

The nickel situation shows outstanding strength. The demand for nickel shows practically no sign of abating. The use of rustless steels is on the increase and at the present time production capacity in this country for these new products is inadequate to supply requirements. These products are very heavy users of nickel and will continue to require increasing tonnages for a long time to come.

The demand for Monel metal is at its peak at the present time. Deliveries, however, are not so far behind as heretofore. It is advisable to keep requirements pretty well covered.

The whole situation may be summarized by saying that inventories are low, the credit situation excellent, excessive money rates have been broken down to more nearly normal and, while up to the present time a slight recession in business activity has been noted, it is the consensus of our business leaders that fundamentally the situation is sound.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

NOVEMBER 1, 1929.

There was no exceptional market activity in copper during October. The monthly turnover represented an appreciable decrease in sales volume as compared with the heavy transactions in September.

Copper sales established a record in September, however, and naturally the momentum of business last month slowed down to quiet trading of moderate proportions.

For the sixth consecutive month, the domestic price of electrolytic copper has been maintained at 18 cents per pound delivered to Connecticut Valley points. Prices rose steadily in October, 1928, from 15¼ cents to 16 cents. Market values now are 4¾ cents a pound higher than for two years.

The conspicuous strength of the copper market has been coincident with an unusually high plane of activity at American consuming centers. Production and consumption of copper established new high records this year. Mill operations reveal large expansion.

Domestic deliveries during the first nine months of 1929 amounted to 1,773,102,000 pounds as compared with 1,396,756,000 pounds for the corresponding months in 1928, an increase of 376,346,000 pounds, or over 26%. Deliveries for export for the nine months this year were 121,606,000 pounds less than those last year. Total deliveries to the home trade and for foreign shipment during the nine months period in 1929 were 254,740,000 pounds more than in the corresponding months in 1928.

Refined stocks on October 1 were 189,502,000 pounds, a reduction of 19,242,000 pounds in September.

The recent decisive crash in the stock market has a sympathetic action on current business. This is the natural outcome of the downward sweep in security values. Conditions in the copper industry and allied enterprises have been remarkably active and prosperous over a long period of many months. Extension of

facilities and a substantial program of wider operations are also in prospect for 1930. And while fundamental conditions in the business world generally are regarded as sound, it is not improbable that a period of readjustment along distinctly conservative lines may follow the tremendous collapse in the stock market. At present consumers are naturally hesitant until conditions in financial circles are more settled and less uncertain.

Large requirements for November and December are still uncovered.

ZINC

Recent developments marketwise have brought about a downward tendency. It is obvious that the present rate of demand gives decided strength to the situation. Prime Western slab zinc was quoted at 6.60c. to 6.70c. East St. Louis with buying light. The London market has also reached a level where foreign metal is liable to come in competition with the American product at Atlantic seaboard points. Transportation charges to inland destinations are an obstacle to profitable handling of shipments to interior points.

The two markets are close together, however, and the situation is not conducive to stability in the East.

TIN

Uncertain factors and declining prices abroad were features in the tin situation. A sagging tendency also developed here early in the month and during the first half of October prices of prompt Straits dropped from 44¼c. to 42¼c. There was considerable business done between these figures, but the market underwent a sharp reaction in the second half of the month which sent prompt Straits down to 40¾c. This level brought in more orders from consumers and there was a quick comeback of the market to 41¾c. for spot Straits. The improvement did not last, however, and the weakness in the stock market and depression at London combined to bring about a decline to 40¾c. The market

at close of month was erratic and unsettled. The world's visible supply of tin was 24,556 tons on October 1, a decrease of 1,844 tons from September 1. Continued heavy production at all centers of output is the development which engages the careful attention of the trade.

LEAD

Consumers bought conservatively and on a hand-to-mouth basis in the early part of October. Around the middle of the month, however, inquiries increased and consumers covered requirements for nearby shipment on a fairly large scale on the basis of 6.90c New York and 6.70c East St. Louis. Brisk business was not maintained after the moderate buying flurry quieted down and new demand became more restricted. The slump on the stock market had its effect on trade sentiment for the time being. Consumption gives promise to continue on a heavy scale during the closing weeks of the year. There are many requirements backing up, and with the lowering of the price to 6.75c New York and 6.55c East St. Louis the action of the market is more favorable to consumers.

ALUMINUM

The marketing of aluminum goes on at a good rate at stabilized prices. This metal maintains quotations with characteristic firmness, but recently there were indications that consumers were inclined to follow the policy of hand-to-mouth buying. The curtailment in automobile production makes some difference in demand, but other industries continue to take large tonnages. Exports of aluminum from Canada in September totaled 1,372,800 pounds compared with 2,966,000 pounds in August and 6,715,900 pounds in September, 1928.

Imports of aluminum into this country in the first eight months of 1929 amounted to 32,575,319 pounds against 18,198,035 pounds in the corresponding months of 1928, being an increase of 14,377,284 pounds.

ANTIMONY

The market for antimony showed improvement lately both in tone and activity. A fairly substantial tonnage was taken by consumers as signs of strength developed. Chinese regulus is held at 8½c duty paid, and that price compares with 8½c a few weeks ago. China has been firmer recently and output at that source is reported on a reduced scale which tends to give the market a fair degree of stability. Conditions at the month-end were not specially active, but there was no pressure to sell apparent and the tone was steady.

QUICKSILVER

A steady undertone is noted for quicksilver and some business is passing. Prices for spot supplies are quoted at \$124 to \$124.50 per flask of 76 pounds.

PLATINUM

The position of platinum is steady at \$61.50 to \$62 per ounce for refined platinum. Current movements are of routine character in moderate quantities.

SILVER

The general position of the market for silver shows no material improvement. Nothing has occurred to bring about a pronounced rally in prices. Quotations have broken through the 50 cent level and present price is 49½ cents per ounce. Chinese traders operated both ways lately. A little support resulted from speculative buying, but it was not sufficient to overcome the adverse conditions. India bought on a moderate scale as price sagged. This market is urgently in need of some corrective measure that will change the trend for the better. World output of silver in July, last month for which figures are available, was 22,057,000 fine ounces, against 18,202,000 ounces in June and 18,457,000 ounces in July, 1928, according to returns by American Bureau of Metal Statistics. This compares with average monthly production of 18,889,000 ounces in 1928.

OLD METALS

Demand for scrap metal was less active during a good part of October. The tonnage moving into domestic and foreign channels of outlet has been on a more restricted scale. The tone of market was also easier, and dealers were more conservative because of the erratic fluctuations in the London standard market. Operations were only moderate, and the outlook hinges on the nature of developments the next few weeks in the position of primary copper. The outgo to foreign countries lately was in good volume, particularly to Germany and France. The trade generally are waiting for more settled conditions before operating freely. New York dealers' purchasing basis is 15½c to 15¾c for crucible copper, 12¼c to 12½c for light copper, 8c to 8¼c for heavy brass, 7¼c to 7½c for light brass, 4¼c to 5c for heavy lead, 11c to 11¼c for new brass clippings, and 17¼c to 18c for aluminum clippings. Prices subject to daily change.

Daily Metal Prices for the Month of October, 1929

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	7	8	9	10	11	12*	14	15	16	17
Copper c/lb. Duty Free														
Lake (Del.)	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125
Electrolytic (f. a. s. N. Y.)	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Casting (f. a. b. N. Y.)	17.625	17.625	17.625	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50
Zinc (f. a. b. St. L.) c/lb. Duty 1¼c/lb.														
Prime Western	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80
Brass Special	6.90	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85
Tin (f. a. b. N. Y.) c/lb. Duty Free														
Straits	44.25	43.50	44.00	43.875	43.875	43.50	43.60	43.375	43.00	42.375	42.25	42.25	41.50	41.50
Pig 99%	43.50	42.875	43.50	43.25	43.25	42.875	43.00	42.875	42.375	41.75	41.625	41.625	40.875	40.875
Lead (f. a. b. St. L.) c/lb. Duty 2¼c/lb.														
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.														
Ingot	35	35	35	35	35	35	35	35	35	45	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.														
Silver c/oz. Troy Duty Free	50.25	50.125	50.00	50.125	50.00	49.625	49.625	50.00	49.625	49.75	50.125	49.875	49.625	49.625
Platinum \$/oz. Troy Duty Free														
	62	62	62	62	62	62	62	62	62	62	62	62	62	62
	18	21	22	23	24	25	28	29	30	31	High	Low	Aver.	
Copper c/lb. Duty Free														
Lake (Del.)	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125
Electrolytic (f. a. s. N. Y.)	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Casting (f. a. b. N. Y.)	17.50	17.25	17.25	17.25	17.25	17.25	17.25	17.125	17.00	17.00	17.625	17.00	17.391	17.391
Zinc (f. a. b. St. L.) c/lb. Duty 1¼c/lb.														
Prime Western	6.80	6.70	6.70	6.70	6.70	6.70	6.70	6.60	6.60	6.50	6.80	6.50	6.743	6.743
Brass Special	6.85	6.75	6.75	6.75	6.75	6.75	6.75	6.65	6.65	6.55	6.90	6.55	6.796	6.796
Tin (f. a. b. N. Y.) c/lb. Duty Free														
Straits	41.20	40.375	41.375	41.75	41.875	41.50	40.875	40.75	41.25	41.75	44.25	40.375	42.35	42.35
Pig 99%	40.60	39.75	40.625	41.00	41.125	40.75	40.125	40.00	40.50	41.125	43.50	39.75	41.695	41.695
Lead (f. a. b. St. L.) c/lb. Duty 2¼c/lb.														
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.														
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.														
Silver c/oz. Troy Duty Free	50.00	49.75	49.875	50.00	50.00	50.125	49.875	49.875	49.875	50.00	50.25	49.625	49.625	49.625
Platinum \$/oz. Troy Duty Free														
	62	62	62	62	62	62	62	62	62	62	62	62	62	62

*Holiday.

Metal Prices, November 4, 1929

NEW METALS

Copper: Lake 18.125. Electrolytic 18.00. Casting, 17.00.
Zinc: Prime Western, 6.50. Brass Special, 6.50.
Tin: Straits, 40.125. Pig, 99%, 39.50.
Lead: 6.35. Aluminum, 24.30. Antimony, 8.50.

Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., \$124.50. Bismuth, \$1.70.
Cadmium, 95. Cobalt, 97%, \$2.60. Silver, oz., Troy, 49.875.
Gold: oz., Troy, \$20.67. Platinum, oz., Troy, \$62.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	12¾ to 14
Brass Ingots, Red	15¾ to 16¾
Bronze Ingots	16¾ to 20
Casting Aluminum Alloys	21 to 24
Manganese Bronze Castings	27 to 39
Manganese Bronze Ingots	14 to 20
Manganese Bronze Forging	35 to 43
Manganese Copper, 30%	28 to 40
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½ to 19¾
Phosphor Bronze	17 to 21
Phosphor Copper, guaranteed 15%	21½ to 25
Phosphor Copper, guaranteed 10%	20½ to 24
Phosphor Tin, no guarantee	50 to 65
Silicon Copper, 10%, according to quantity	30 to 25

OLD METALS

Buying Prices		Selling Prices
15½ to 15¾	Heavy Cut Copper	16½ to 16¾
14¾ to 15	Copper Wire, mixed	15¾ to 16
12¾ to 13½	Light Copper	13¾ to 14½
12¾ to 12¾	Heavy Machine Composition	13¾ to 13¾
8¼ to 9	Heavy Brass	9¼ to 10
7 to 7½	Light Brass	8 to 8½
9½ to 10	No. 1 Rod Brass Turnings	10½ to 11
11¼ to 11¾	Composition Turnings	12¼ to 13
5½ to 5¾	Heavy Lead	6¾ to 6¾
3 to 3½	Zinc Scrap	4 to 4½
8 to 8½	Scrap Aluminum Turnings	9 to 9½
11 to 12	Scrap Aluminum, cast alloyed	16 to 17
16½ to 18	Scrap Aluminum sheet (new)	18½ to 20
26 to 28	No. 1 Pewter	31 to 34
20 to 21	Old Nickel Anodes	22 to 23
20 to 23	Old Nickel	22 to 25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled)	27¾c. to 28¾c. net base
From Stock	28¾c. to 29¾c. net base

BARE COPPER WIRE

19½c. to 19¾c. net base, in carload lots.

COPPER SEAMLESS TUBING

29¼c. to 30¼c., net base.

SOLDERING COPPERS

300 lbs. and over in one order	26¼c. net base
100 lbs. to 200 lbs. in one order	26¼c. net base

ZINC SHEET

Duty on sheet, 2c., per pound	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount	10.50 net base
Casks, jobbers' price	10.75 net base
Open casks, jobbers' price	11.25 to 11.75 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price, ton lots	33.30c.
Aluminum coils, 24 ga., base price, ton lots	31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices	
Cold Drawn Rods	53c.
Hot Rolled Rods	45c.
Cold Rolled Sheet	60c.
Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over N. Y. Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 51.75c. per ounce, Troy upward, according to quantity.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 16, 1929

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	\$0.23¼	\$0.25	\$0.26¼
Wire .....	.23¼	.25½	.26¼
Rod .....	.21¼	.25¼	.27
Brazed tubing .....	.30¾	....	.35¾
Open seam tubing .....	.31¼	....	.34¼
Angles and channels .....	.31¼	....	.34¼

BRASS SEAMLESS TUBING

28¼c. to 29¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	25¼c. net base
Muntz or Yellow Metal Sheathing (14"x48") ..	24c. net base
Muntz or Yellow Rectangular sheet other Sheathing	25c. net base
Muntz or Yellow Metal Rod	22¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices			
Grade "A" Sheet Metal		Wire and Rod	
10% Quality	31¾c.	10% Quality	34¼c.
15% Quality	33c.	15% Quality	37¼c.
18% Quality	34¼c.	18% Quality	41c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base) 35	Full Finished Sheets (base) 42
Cold Drawn Rods (base) 40	Cold Rolled Sheets (base) 50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, November 4, 1929

ANODES

Copper: Cast	28c.	per lb.	Nickel: 90-92%	45c.	per lb.
Rolled, oval	27c.	per lb.	95-97%	47c.	per lb.
Rolled, sheets, trimmed	27 1/4c.	per lb.	99%	49c.	per lb.
Brass: Cast	27c.	per lb.	Silver: Rolled silver anodes .999 fine are quoted from 53 1/2c.,		
Zinc: Cast	12 5/8c.	per lb.	Troy ounce, upward, depending upon quantity.		

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	\$3.00/lb.	\$2.75/lb.	\$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under 1/2	4.25	4.00	3.90
6 to 24	1/2 to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	1/4 to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	1/4 to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.		
12" 20 ply 64/28 Unbleached.....	\$28.27to	\$28.30
14" 20 ply 64/68 Unbleached.....	36.45to	37.34
12" 20 ply 80/92 Unbleached.....	31.25to	34.16
14" 20 ply 80/92 Unbleached.....	42.40to	46.09
12" 20 ply 84/92 Unbleached.....	36.60to	42.90
14" 20 ply 84/92 Unbleached.....	49.60to	57.60
12" 20 ply 80/84 Unbleached.....	38.35to	39.37
14" 20 ply 80/84 Unbleached.....	52.00to	53.12
Sewed Pieced Buffs, per lb., bleached.....	52c.	to 71c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	14-20	Iron Sulphate (Copperas), bbl.	lb.	.01 1/4
Acid—Boric (Boracic) Crystals	lb.	.08 1/2	Lead Acetate (Sugar of Lead).....	lb.	.13 3/4
Chromic, 75 to 400 lb. drums	lb.	19-21	Yellow Oxide (Litharge)	lb.	.12 3/4
Hydrochloric (Muriatic) Tech., 20°, Carboys.....	lb.	.03	Mercury Bichloride (Corrosive Sublimate).....	lb.	\$1.58
Hydrochloric, C. P., 20 deg., carboys.....	lb.	.06	Nickel—Carbonate, dry bbls.	lb.	.35
Hydrofluoric, 30%, bbls.....	lb.	.08	Chloride, bbls.	lb.	.21 1/2
Nitric, 36 deg., carboys.....	lb.	.06	Salts, single, 300 lb. bbls.	lb.	.13
Nitric, 42 deg., carboys.....	lb.	.07	Salts, double, 425 lb. bbls.	lb.	.13
Sulphuric, 66 deg., carboys.....	lb.	.03	Paraffin	lb.	.05-.06
Alcohol—Butyl	lb.	.16 3/4-.21 1/4	Phosphorus—Duty free, according to quantity.....	lb.	.35-.40
Denatured, drums	gal.	.50-.60	Potash, Caustic Electrolytic 88-92% broken, drums. lb.		.083
Alum—Lump, Barrels	lb.	.0385	Potassium Bichromate, casks (crystals)	lb.	.09 1/4
Powdered, Barrels	lb.	.039	Carbonate, 96-98%	lb.	.06 3/4-.07
Aluminum sulphate, commercial tech.....	lb.	3.3	Cyanide, 165 lb. cases, 94-96%.....	lb.	.57 1/2
Aluminum chloride, solution in carboys.....	lb.	.06 1/2	Pumice, ground, bbls.	lb.	.02 1/2
Aluminum—Sulphate, tech., bbls.....	lb.	.33	Quartz, powdered	ton	\$30.00
Sulphocyanide	lb.	.65	Rosin, bbls.	lb.	.04 1/2
Arsenic, white, kegs	lb.	.05	Rouge, nickel, 100 lb. lots	lb.	.25
Asphaltum	lb.	.35	Silver and Gold	lb.	.65
Benzol, pure	gal.	.60	Sal Ammoniac (Ammonium Chloride) in casks.....	lb.	.05 1/2
Borax Crystals (Sodium Biborate), bbls.....	lb.	.04 1/2	Silver Chloride, dry, 100 oz. lots	oz.	.40 1/2
Calcium Carbonate (Precipitated Chalk).....	lb.	.04	Cyanide (fluctuating)	oz.	.50-.55
Carbon Bisulphide, Drums	lb.	.06	Nitrate, 100 ounce lots	oz.	.35
Chrome Green, bbls.	lb.	.29	Soda Ash, 58%, bbls.	lb.	.02 1/2
Chromic Sulphate	lb.	.30-.50	Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.18
Copper—Acetate (Verdigris)	lb.	.25	Hyposulphite, kegs	lb.	.04
Carbonate, bbls.	lb.	.21 1/2	Nitrate, tech., bbls.	lb.	.04 3/4
Cyanide (100 lb. kgs)	lb.	.45	Phosphate, tech., bbls.	lb.	.03 3/4
Sulphate, bbls.	lb.	6.2	Silicate (Water Glass), bbls.	lb.	.02
Cream of Tartar Crystals (Potassium Bitartrate).....	lb.	.27	Sulpho Cyanide	lb.	.32 1/2
Crocus	lb.	.15	Sulphur (Brimstone), bbls.	lb.	.02
Dextrin	lb.	.05-.08	Tin Chloride, 100 lb. kegs	lb.	.35
Emery Flour	lb.	.06	Tripoli, Powdered	lb.	.03
Flint, powdered	ton	\$30.00	Wax—Bees, white, ref. bleached.....	lb.	.60
Fluor-spar (Calcic fluoride)	ton	\$70.00	Yellow, No. 1	lb.	.45
Fusel Oil	gal.	\$4.45	Whiting, Bolted	lb.	.02 1/2-.06
Gold Chloride	oz.	\$14.00	Zinc, Carbonate, bbls.	lb.	.11
Gum—Sandarac	lb.	.26	Chloride, casks	lb.	.06 3/4
Shellac	lb.	.59-.61	Cyanide (100 lb. kegs).....	lb.	.41
			Sulphate, bbls.	lb.	.03 1/2